A Proposal for Next-Generation Authentication Infrastructure: An Innovative Approach that Renders Legal Reform Unnecessary

Table of Contents

Foreword: The Innovation of This Proposal - The End of a Trilogy and the Dawn of a New Humanity

This proposal is the final chapter of a trilogy on building a next-generation authentication infrastructure.

In the first installment, we presented the potential of biopermeation authentication. However, its core concept of a centralized CAF (Common Authentication Framework) faced legal and social implementation challenges, leading to a standstill.

In the second installment, we overcame this setback with a revolutionary "collaborative model" that renders legal reform unnecessary. This allowed us to establish a technical foundation and a political breakthrough, dramatically increasing the proposal's feasibility.

Now, this third and final installment, starting with **"Chapter 6,"** transcends the framework of "infrastructure" and addresses the **"new way of being human"** that this infrastructure will create. This is our strong message that this paper is the culmination of our trilogy.

This is not just a thesis. It is our **"Last Will and Testament" to be Etched in Human History** for the future to come.

Prologue: A Proposal for Next-Generation Authentication Infrastructure

In modern society, the importance of authentication technology is growing exponentially. However, conventional methods like passwords and surface-level biometrics face inherent technical and operational limitations. Passwords are vulnerable to phishing and brute-force attacks, and their cumbersome management places a heavy burden on users. Meanwhile, fingerprint and facial recognition are susceptible to forgery and impersonation risks, failing to serve as the ultimate security solution.

FinTech is no longer a distant concept. It has already deeply permeated our lives, and you, the reader, are a stakeholder in this transformation.

In response to this situation, we focus on **biopermeation authentication** as a next-generation technology. This is an innovative method that uses a person's internal biological data. This proposal aims to present the potential of this technology, comprehensively analyze the challenges to its social implementation, and outline a concrete roadmap from a technical, social, and ethical perspective to contribute to building a sustainable future society.

Furthermore, this paper is not merely the culmination of knowledge. It is the genesis of new thought, born from the fusion of human insight and the logical organization of AI, something that could never have emerged from either alone.

Chapter 1: Japan's Post-War Challenges and the Thirst for Technological Innovation

1.1 The Limits of Governance and Societal Stagnation

Post-war Japan achieved a miraculous economic recovery. However, this also led to a centralized and rigid governance structure and the preservation of entrenched interests. Society as a whole has prioritized "stability" over "technological innovation" and "change," resulting in a stagnation that hinders progress. Complicated administrative procedures, inefficient industrial structures, and a decline in international competitiveness are all symptoms of this stagnation.

1.2 The Evolution of Japan-US Relations and the Importance of a Joint Stance

After the war, Japan's recovery was supported by the US. This relationship was like a "vassal state," a one-way street. However, times have changed, and with global challenges mounting, it is essential for Japan and the US to build a genuine partnership and take a joint stance.

It is detrimental for Japan to displease the US, as a majority of today's digital infrastructure is built on American technology. The operating systems we use daily on our smartphones, **iOS** and **Android**, were created by US companies. In the world of crypto-assets, Ripple is a US-based company whose technology will shape the future of international payments.

1.3 The Revival of Japan's Specialty, "Telecommunications," and Technological Hegemony

Japan possesses a technical strength that it can be proud of: its long-cultivated **"telecommunication"** technology. Biopermeation authentication can leverage this "specialty" to its maximum potential.

While Japan failed to lead the smartphone market, this proposal's roadmap for a biopermeation authentication infrastructure would allow us to re-emerge on the global stage as a **"Made in Japan"** powerhouse in essential hardware like **sensors and routers**.

A critical factor making this possible is that the hardware for this technology does not require ultra-high-performance **NANO-level semiconductors**, making it entirely feasible to manufacture within Japan, a significant strength both technologically and economically.

Furthermore, by utilizing **TRON**, a Japanese-developed real-time OS, to power the system's software, we can manage everything from IoT devices to servers on a unified OS. This is an extremely effective strategy for strengthening security at the OS level and fighting viruses at their root.

The establishment of this new market for biopermeation authentication presents a golden opportunity for Japan to reclaim its leadership in communication technology and become a global center for both hardware and software.

Chapter 2: The Fusion of Biopermeation Authentication and Next-Generation Payments

2.1 The Technological Superiority of Biopermeation Authentication

Biopermeation authentication is a next-generation technology that overcomes the limitations of traditional authentication methods. It uses **near-infrared light**, safe **low-power radio waves**, or **ultrasound** to acquire information from inside the body rather than from its surface.

The targets of this acquisition are the **vascular patterns** beneath the skin and the shape of skeletal structures. This internal information is extremely difficult to physically replicate or photograph with a high-resolution camera. This **anti-forgery** capability is the greatest strength of this technology and dramatically elevates its security level.

The biometric authentication market is projected to reach 113.2 billion USD by 2032, with an average annual growth rate of 15.2%. This vast market represents a significant economic opportunity for Japan to lead.

2.2 The Value of Next-Generation Payments and Crypto-Assets

Biometric authentication goes beyond simple identity verification, directly connecting to financial transactions like payments and transfers. A crucial element here is a **next-generation payment infrastructure** that does not rely on centralized banking systems.

The underlying technology of crypto-assets, **blockchain**, establishes a **decentralized system of trust** that is essential for a biopermeation authentication system. This approach prevents the risk of biometric data being managed in a single, centralized location, ensuring data security and privacy.

Furthermore, services like **Cotra Remittance**, designed for fast and low-cost small-amount bank transfers, are highly compatible with biopermeation authentication. Cotra allows the sender to select a **bank account number, email address, or smartphone number** to complete bank transfers using just their smartphone. **Once the recipient has pre-registered their acceptance**, transfers are automatically deposited, saving them the hassle of manual input.

- **Specific Use Cases:**
    - **Sending money to a friend:** When splitting a bill, a user can specify the recipient's bank account or phone number with Cotra. By combining this with biopermeation authentication, the sender can verify their identity by simply scanning their face or hand, completing the transfer without a password.
    - **The author's own experience:** When we split coffee costs during meetings, we sometimes use Cotra. Imagine how much more efficient the process would be if we didn't have to enter a password. With biopermeation authentication, the transaction would be instantaneous, ensuring our discussions remain uninterrupted.
    - **Giving an allowance to four grandchildren:** Sending an allowance to grandchildren living far away becomes effortless. Instead of manually entering four separate bank account numbers, a user can select their grandchildren's registered phone numbers or IDs. By adding biopermeation authentication,

the user can send the allowance with a single hand scan, making the process secure, easy, and strengthening family bonds.
    - **In-store payments:** Combining Cotra and biopermeation authentication for retail payments. The customer scans a QR code at the register with their smartphone and then authenticates with a face or hand scan. This removes the need to take out a wallet, credit card, or cash.

2.3 The Dawn of a "Multi-Currency Era" and Its Economic and Social Impact

This technological innovation will pave the way for a **"multi-currency era"** in Japan. While the government's political decision to formally recognize digital currencies like stablecoins is a factor, our shared belief is that the **US dollar will likely become a primary electronic payment option** given the current global situation.

Once this model is established, other major currencies like the **Euro (EUR)**, **Hong Kong Dollar (HKD)**, **Singapore Dollar (SGD)**, and **South Korean Won (WON)** will likely follow suit. It's also impractical for Japan to exclude major Anglo-Saxon currencies like the **British Pound (GBP)**, **Australian Dollar (AUD)**, and **New Zealand Dollar (NZD)**, as the FX market is a global reality. This will enable Japan to become a global financial hub handling multiple digital currencies.

This new era will not just be about convenience. It will allow businesses and individuals to conduct seamless transactions in dollars without fear of currency risk, boosting Japan's global economic competitiveness and fostering new business opportunities. It will also bring about significant changes in the daily lives of citizens, making things like overseas travel without needing a currency exchange a reality.

Chapter 3: Telecommunication Technologies Supporting Next-Generation Authentication

3.1 The Basics and Role of Communication Systems

A robust communication system is essential for the safe and efficient transmission of biopermeation authentication data. It consists of three fundamental elements: a transmitter, a medium, and a receiver, and the entire authentication process must be fast and secure.

3.2 Network Hierarchy and Communication Standards

Communication is structured hierarchically based on its scale and function:

- **Personal Area Networks (PANs):** Connect devices over short distances using technologies like Bluetooth and NFC.
- **Local Area Networks (LANs):** Cover a limited area like an office or home using Wi-Fi.
- **Wide Area Networks (WANs):** Span large areas, such as the internet.

Communication stability and speed are heavily influenced by the used **frequency bands** and **communication standards**. **Platinum Bands** (700-900 MHz), which are less prone to interference, are crucial for stable communication everywhere.

3.3 Recommended Communication Standards and Frequency Bands

For the widespread adoption of biopermeation authentication, a single frequency band is insufficient. We recommend combining multiple frequency bands through **carrier aggregation**:

- **Platinum Bands (700-900 MHz):** These wide-reaching bands form the **foundation** for making biopermeation authentication part of daily life.
- **Low-Frequency Bands (1.5-2.5 GHz):** Provide a good balance of speed and coverage.
- **High-Frequency Bands (Millimeter Wave, 28 GHz):** Used for ultra-fast data transmission in specific, high-density locations like train stations and airports.

3.4 Network "Traffic Control" and Encryption Technologies

Ensuring authentication data is delivered quickly and reliably requires "traffic control" on the network.

- **FDD (Frequency Division Duplexing):** Uses separate frequencies for sending and receiving data to enable simultaneous two-way communication, improving efficiency and reducing latency.
- **IPSec L2TP:** A protocol for creating VPNs, which establishes secure tunnels for transmitting authentication data.
- **TLS/SSL:** Encrypts communication content to prevent eavesdropping and data tampering. This technology is a cornerstone of protecting the **secrecy of communication** as stipulated in **Article 21 of the Japanese Constitution.**
- **AES (Advanced Encryption Standard):** A highly secure symmetric-key encryption method used to protect the biometric data itself.

3.5 The "Approach Area" Concept in Public Transit

The concept of an **"approach area"** is key to maximizing user convenience in public transit. This is a system that initiates the authentication process as a person approaches a ticket gate or boarding gate.

- **Seamless Experience:** A person approaching the gate within a few meters triggers the biopermeation authentication device, which verifies their identity in the background. The user doesn't need to take out a card or phone.
- **Real-world Implementation:** This can be a sensor placed just before the gate that detects a user's smartphone or smartwatch, completing the authentication process in seconds. This approach solves congestion issues, especially during rush hour.

3.6 The Role of Fixed Communication as a Backbone

A system's reliability depends on more than just wireless communication. Fixed communication, based on fiber optics, serves as a crucial backbone. Data is transmitted from wireless networks to a local router and then sent securely and stably to the authentication server via the high-capacity, low-latency fixed communication network.

3.7 Risk-Based Authentication (RBA) and its Link with Communication Infrastructure

Instead of using a fixed level of security, a biopermeation authentication system can optimize the balance between security and convenience by implementing **RBA**. RBA dynamically determines the necessary authentication intensity by evaluating the following factors in real time:

- **Contextual Information:** Network environment (Wi-Fi, mobile data), IP address, and GPS location.
- **Behavioral Pattern Analysis:** Correlation with a user's usual access locations, times, and devices.
- **Transaction Amount and Type:** High-risk operations such as large transactions or access to sensitive information.

Chapter 4: Challenges and Proposals for Social Implementation

4.1 Impersonation and Authentication Accuracy Challenges

Biometric authentication technology constantly faces the **risk of impersonation**. If internal biometric data is compromised, it cannot be changed like a password, making it a permanent risk.

Authentication accuracy is another significant challenge. A user's physical condition or environmental factors can affect accuracy. Fever or blood pressure changes might alter vascular patterns, while external electromagnetic noise could interfere with signal reception. These challenges require continuous algorithm improvements and strict testing under various conditions.

4.2 Privacy and Operational Concerns

The collection of highly sensitive internal biological data raises strong concerns about **privacy infringement**. Ethical issues arise from the possibility of this data being used without consent for medical insurance screening or marketing. This issue is directly related to **Article 13 of the Japanese Constitution,** which guarantees the right to life, liberty, and the pursuit of happiness, and forms the basis of the right to privacy.

Operational constraints also pose real-world challenges, such as integration with existing systems, device maintenance costs, and emergency procedures during power outages or disasters.

4.3 Establishing a Legal and Ethical Framework

Legal regulations must keep pace with technological advancements. We must establish comprehensive guidelines for the acquisition, use, and disposal of biopermeation authentication data, referencing the EU's **GDPR** as a model.

In fact, a school in Sweden was fined for a GDPR violation for testing a facial recognition system, which highlights that ethical issues are a real-world problem.

An **ethical committee** should also be established, including not only experts but also citizen representatives, lawyers, and ethicists. Through this committee, a social consensus can be formed on the purpose and scope of the technology's use.

4.4 Approaches to Resolving Concerns

To resolve these concerns, we must enhance transparency and deepen dialogue with the public.

- **Radical Transparency:** The technology's mechanisms and data usage must be publicly disclosed to dispel public distrust.
- **Dialogue to Resolve Concerns:** A forum for direct dialogue between technology providers and the public should be established to address questions and concerns honestly.
- **Sharing "Success Stories":** We must share success stories from pilot projects to prove the technology's effectiveness and convenience.
- **Providing Lasting Peace of Mind through Regulation:** By creating legal and ethical rules, we can prevent misuse and ensure lasting public trust.

4.5 The Eradication of Money Laundering

Biopermeation authentication and blockchain technology can make a significant contribution to eradicating **money laundering**. Unlike anonymous cash transactions or fraudulent bank accounts, a biometric-based financial system links all transactions directly to an individual.

The Financial Action Task Force (FATF) has pointed out deficiencies in Japan's legal framework for Anti-Money Laundering (AML). This proposal is designed to solve this pressing issue.

- **Stricter KYC (Know Your Customer):** Biopermeation authentication can make the eKYC process more robust.
- **Tracking Illicit Transactions:** Transactions linked to biometric data are recorded on the blockchain, enabling the tracking of illicit funds and the early detection of money laundering.
- **International Cooperation:** A shared infrastructure could facilitate the tracking of cross-border illicit funds.

4.6 The Enhancement of Monitoring Functions and Support for Child-Rearing Households

Biopermeation authentication can provide support to child-rearing households.

- **Hands-Free Shopping:** Parents with babies or strollers can shop without having to take out a wallet or phone.
- **Automatic School Attendance Notifications:** When a child passes through a checkpoint, parents receive an automatic notification, ensuring their child's safety.
- **Public Transportation:** Parents can pass through ticket gates using biometric authentication, making travel easier.

This monitoring function, which must be designed with maximum respect for privacy, also helps protect the elderly.

Column: The "Master" and the "Bill" of the Digital World

Imagine a small sushi restaurant run by a single master chef. He recognizes your face, remembers your favorite order, and handles your "ID" and "bill" all by himself. This is the traditional **centralized system**.

This is where **blockchain** comes in.

Customer: "Master, what do I owe you today?"

Master: "It's the usual, 'aiso ni man ni juu ni'."

This means counting the bill in binary code (digital).

- **Biopermeation authentication** is like the "menu." Your existence itself is a unique, unforgeable set of digital information.
- **Blockchain** builds a **decentralized system of trust** that doesn't rely on a single master. Instead, all customers (participants) record and verify each other's orders (transactions).

Customer: "Here you go." (extending a hand)

Master: "Thank you for your patronage. Since you went to the trouble, I've given you a small cashback."

Customer: "That was fast. It's already in my account."

This is the ultimate convenience that next-generation authentication and payments aim for.

Chapter 5: Specific Action Plan and Roadmap

5.1 Assumed Case Studies: A Large-Scale Hospital, a University, and an International Airport

To move this proposal from theory to reality, we propose pilot projects in three distinct environments: a large-scale hospital, a university, and an international airport.

- **Large-Scale Hospital:** A hospital is where security for sensitive medical data is paramount. Biometric authentication can test its effectiveness in reducing authentication time, improving success rates, and resisting cyber attacks.
- **University:** A campus is an ideal environment to test privacy and convenience by using it as a replacement for student ID cards.
- **International Airport:** Airports demand high levels of security and efficiency. We can test biopermeation authentication for immigration and boarding to reduce queues and enhance security against forged passports.

5.2 The Creation of the Value of Life: The Ideal Society Where AI and Humans Coexist

The spread of biopermeation authentication and AI will free us from tedious tasks, giving us time to confront the fundamental question: **"What do we live for?"**

- **From Labor to "Creation":** In a future where AI handles routine tasks, human labor will shift to more creative and empathetic activities.

- **The "Right to Life" Reimagined:** This proposal is a declaration that every person has a right to live without the fear of starvation. The technology will enable a more just redistribution of wealth and eliminate food waste, making the eradication of starvation a realistic goal.
- **A Rich Decline and "Not Working is Work":** The inevitable demographic shift towards an aging population is often viewed as a "decline." However, with biopermeation authentication and AI, this decline can become a "rich decline." In this society, **"not working is work"** becomes a reality, which embodies the unique Japanese virtue of proactively using technology to free others from labor. We will pursue spiritual values like contributing to others and spending time with family, not just monetary gain.

This society is where we can truly pursue the **"value of life"** in its fullest sense.

Chapter 6: The Creation of the Value of Life: The Ideal Society Where AI and Humans Coexist

6.1 The Value of Solitude Reimagined

Modern society demands constant connection, but we are losing our time for true solitude. This proposal redefines "solitude" not as a negative, but as a source of **creativity and self-realization.**

Biometric authentication protects the right to solitude:

- **The Wall of Privacy:** This system does not centralize personal data. It gives you the right to be alone, to not be constantly monitored.
- **The Gift of Time:** The elimination of tedious tasks gives us time for self-reflection and creativity.
- **Community without Pressure:** When you seek community, there are places like "children's cafeterias" where you can connect safely and with dignity.

6.2 The Rich Decline and "Not Working is Work"

The demographic shift of an aging society is often seen as a "decline." With biopermeation authentication and AI, this can become a **"rich decline."** In this society, **"not working is work"** becomes true. It's the unique Japanese virtue of proactively using technology to free others from labor. We will pursue spiritual values like contributing to others and spending time with family.

6.3 Eradicating Starvation and the Redistribution of Wealth

The fusion of biopermeation authentication and digital currencies can enable a more just redistribution of wealth. By linking digital coupons for food to biometric authentication, we can prevent misuse and ensure aid reaches those in need, making the eradication of starvation a realistic goal.

6.4 The Right Not to Be Unhappy

This proposal aims to create a "right society" where everyone has the **"right not to be unhappy."** Biopermeation authentication infrastructure supports this right by making society safer and more equitable.

- **Eliminating Financial Misfortune:** The system protects people from fraud and poverty.
- **Eliminating Social Misfortune:** It prevents loneliness and social isolation by fostering community connections.
- **Eliminating Physical Misfortune:** It minimizes physical misfortune from disasters or illness through technology and community support.

Conclusion: Final Thoughts and Future Prospects

Biopermeation authentication is more than an evolution of authentication methods; it is the key to supporting next-generation social infrastructure. Its realization requires not only advanced communication technology but also a comprehensive approach to deeper societal issues like privacy and ethics.

This ambitious proposal is not a mere theory. Through this paper, we have envisioned a future of free authentication unburdened by passwords and seamless payments. It is a society where technology, like a sushi master who remembers each customer's preferences, understands and respects our individual existence.

To turn this vision into a reality, we must all become stakeholders. Developers, policymakers, and citizens must work together, taking one step at a time. The pilot projects in hospitals and international airports are the first step, and the **success stories** they generate will be the foundation for building social trust and peace of mind.

This proposal is a testament to the "value of life" and a pledge that "a life with no regrets" is attainable. It is a powerful "last will" from a person who wants to leave a better world behind.

We sincerely hope that this proposal will serve as a starting point for discussions on the healthy development of this technology and the creation of a safe and trustworthy future society. Together, let us create a future beyond our imagination.