

FINTECH BOOSTUP

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RETHINKING PAYMENTS: ONLINE, OFFLINE, AND WITH CASH

crunchfish 
RETHINKING PAYMENTS

By Joachim Samuelsson,
CEO of Crunchfish

The payments industry is moving at lightning speed. From instant checkouts to central bank digital currencies (CBDCs), money is now more digital, global, and connected than ever. But I still ask myself the same question: Can payments work anywhere, anytime, and with the same reliability we've always trusted in cash? For years, digital payments have relied on systems that must remain online at all times. But outages, cyberattacks, and spotty connectivity still happen. When they do, both consumers and merchants can be left stranded. That's why cash, despite its limitations, remains the only truly resilient form of payment. At Crunchfish, that's the challenge we set out to solve. We're based in Malmö, Sweden, publicly listed on Nasdaq First North Growth Market, and we're developing a layer-2 solution that rethinks payments in three key areas: online, offline, and with cash.



RETHINKING ONLINE PAYMENTS

My career began in telecom, and I often think of an old Ericsson example: Circuit-switched calls. Back then, every connection along the circuit had to be operational. If one broke, the whole call failed. That's still how many digital payments work today – too fragile, too dependent on everything going right.

We believe payments can do better. At Crunchfish, we apply a packet-switched model, breaking transactions into secure, encrypted packets. These are created locally in Layer-2 wallets which can be validated offline at any node in the system, and then later settled with the underlying (layer-1) payment system. That way, payments can still go through, even if a backend server or the network is down.

We also help banks strengthen their infrastructure. Right now, most transactions hit the bank's core systems directly, which increases risk and strain. Our approach routes all activity through Layer-2 first, creating a buffer that protects what matters most.

One key innovation is digital change. Instead of giving coins or small notes, merchants return the exact amount digitally. It's cost-saving, intuitive for users, and a natural pathway for CBDCs.

Here's how it works:

- Banks and PSPs issue secure wallets (which can be monetised through floats or annual subscription fees)
- The payment network or merchants use lightweight software to validate and accept payments
- Central banks and payment network providers get access to source code, APIs, and offline protocols to ensure their independence and enable universal acceptance of layer-2 payments.

RETHINKING OFFLINE PAYMENTS

If online payments are fragile, offline systems have often gone too far the other way – over-engineered and hard to use. Too much focus has been placed on hardware-level security, and not enough on basic availability.

But payments, like electricity or telecom, should work even when things go wrong. That's why our Layer-2 architecture gives consumers secure offline wallets and merchants terminals that can validate and store payments until they reconnect.

It works like card networks: Wallets send, terminals receive. But our system is more flexible. Terminals can be built into existing POS systems, merchant apps, or PSP software.

We're technology-agnostic, too. Some markets prefer QR codes, others use NFC, Bluetooth, or even ultrasound. We support all of them, ensuring compatibility from high-end to low-end smartphones.

Privacy also matters. We believe online as well as offline payments should be private by default. Small-value transactions

ABOUT THE AUTHOR

Joachim Samuelsson is the CEO and main owner of NASDAQ First North-listed Crunchfish, a pioneering fintech company based in Malmö, Sweden. As a deep tech innovator and serial entrepreneur, Joachim has consistently driven groundbreaking solutions at the intersection of technology and business.

With over 20 granted patents in digital payments and communication technologies, Joachim holds a significant intellectual footprint in the industry. He is widely regarded as a pioneer in offline payment innovation, blending his expertise in robust communication systems with the growing demand for inclusive and resilient payment ecosystems.

Joachim is no stranger to success. He has held leadership positions in seven business exits, including four in which his automatic frequency planning innovation transformed mobile telecom networks. His ability to identify and implement transformative solutions makes him a key figure in the payment and technology industries. Joachim has received numerous awards for his entrepreneurship and vision and continues to lead from the front as Crunchfish shapes the future of offline payments globally.

We apply a packet-switched model, signing out transactions from an isolated runtime environment

can remain completely anonymous, while larger ones trigger compliance checks. It's a practical balance that protects users without compromising regulation.

And when it comes to how offline payments actually work, we propose a Reserve, Pay, and Settle approach. Unlike prepaid "Fund, Pay, and Defund" approaches, which are not recommendable offline, our approach treats payments as guaranteed IOUs ("I Owe You") that settle once online again. This avoids double-spending and keeps the system flexible.

FIXING THE CHANGE PROBLEM

Physical cash is resilient, but it's expensive to handle. For merchants, the biggest headache is handling change, especially coins. It means stocking tills with small denominations and managing the daily logistics of physical cash.

With Crunchfish's Digital Cash solution, that problem disappears. Customers pay with notes, and merchants return the exact change digitally to their bank account or wallet. The experience feels natural to the customer but reduces costs and friction for the retailer.

This could be the breakthrough use case for CBDCs. By embedding digital change into everyday transactions, central banks can introduce digital currency in a way that feels familiar and useful from day one.

THE CRUNCHFISH PRODUCT PACKAGING SOLUTION

Over time, we've shaped our work into a three-part product model:

Online Payments — strengthening digital identification, providing resilience and load balancing

Offline Payments — ensuring resilience, interoperability, and privacy even without connectivity or at backend outages.

Digital Change — removing the burden of coins by making change digital, bridging cash and CBDCs

For banks and PSPs, this means equipping their users with secure wallets. For acquirers and merchants, it means using terminals or shared libraries to accept payments. For central banks and payment networks, it means adopting our APIs and offline protocols to enable universal acceptance.

But it only works when adopted at the network level. It's not about one bank or one market. It's about equipping entire ecosystems to make payments reliable, flexible, and future-proof.

THE ROAD AHEAD

Looking ahead, I believe the future of money is not just about speed or convenience. It's about trust. Payments should never fail, whether they're online, offline, or made with cash.

That's been our mission at Crunchfish: to build a payment system as universal and dependable as the cash we've always relied on.

And as a publicly listed Swedish company, we're in a unique position to lead that change. We combine the transparency of a listed firm with the agility of a fintech.

The message is simple: it's time to rethink payments.

Our layer-2 approach brings resilience and interoperability to any underlying payment system

IF YOU ARE A...

Payment Network Provider:

Layer-2 Terminals enable the ecosystem to receive payments.

For Payment Networks, Central Banks and Regulators:

Resilient digital payments reduce reliance on cash, increase liquidity in the financial system, and support national financial-inclusion goals. This is not just a product; it is a catalyst for ecosystem transformation.

By bridging the last mile of reliability, Crunchfish creates shared value - commercial growth for payment providers and societal benefits in the form of financial inclusion, transparency, and efficiency.

Crunchfish is already engaged in India and across several continents, validating the global demand for solutions that deliver business and societal value. Crunchfish Digital Cash delivers the critical layer of national payment resilience.

Payment Service Provider:

Secure Layer-2 Wallets enable the users to make payments.

For Wallets and Banks:

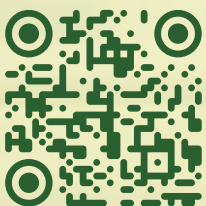
Every attempted payment succeeds, even with network and backend disruptions. This drives higher usage, more transactions, and stronger revenues. A wallet that “always works” becomes a winning user proposition.

For Users:

Confidence to pay digitally anywhere, anytime removes the need to carry cash as a fallback. This convenience accelerates adoption, including segments new to digital payments.

For Merchants:

No sale is lost to a network outage. Digital acceptance becomes truly universal, supporting small businesses and large retailers.



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..LET'S TALK