



INTERIM REPORT

Q2 2024

Back in business

I feel great to be back in business after a nice summer break. Things are busy with us onboarding new partners, preparing proposals and upcoming events. At the same time, we are evaluating our strategic and financing options. Let me share the highlights here.

Alliance with IT-giant

During Q2 Crunchfish entered into an alliance agreement with Tata Consultancy Services (TCS), the largest IT company in the world, to target Central Bank Digital Currency (CBDC) projects around the world. TCS has developed TCS-Quartz, a distributed ledger technology solution, which Crunchfish Digital Cash complements by providing the offline solution. Given that TCS is a global company with operations in 55 countries it significantly improves Crunchfish chances to become part of CBDC projects around the world. This is great opportunity for Crunchfish as we are allowed set our own pricing for such projects as an independent company.

Preparing proposals

Crunchfish's unique Digital Cash technology offering device-agnostic trust in mobile clients is being considered by payment solutions in the world. After having conducted and presented a security and vulnerability assessment for a major payment platform provider we have now been requested to deliver a paid Proof- of-Concept for trusted crypto operations in their mobile clients and prepare a proposal for usage of our patented trust in client technology in all their payment products for domestic as well as international markets. In parallel, we are busy preparing proposals for CBDC-projects around the world. If our technology would be selected for any of these major opportunities this would be a great breakthrough from a commercial and technical standpoint.

Upcoming events

We are active in global conferences to explain our solution and technology to the market. In Q2 Crunchfish exhibited at the Payments week in Kuala Lumpur in two back-to-back conferences: Central Bank Payments Conference followed by the Global Payments Summit. In addition to discussing how to balance the user's need for privacy with the payments system's need for reconciliation we also presented on the theme mistakes to avoid when designing CBDC systems. This was well received and became the basis of the whitepaper Function before form that was published in the July edition of Central Bank Payments News. The article is included in this quarterly report for easy access.

In Q3 we will continue making the argument that layer-2 solutions using virtual secure elements are better at implementing the cash-like features of offline payments and transactional privacy than layer-1 solutions using hardware-based embedded secure elements at three main events. It is the Global Fintech Fest in Mumbai in August, followed by the CBDC conference in Istanbul and two conferences during the Payments, Innovation and Technology week in London in September.

CRUNCHFISH CEO JOACHIM SAMUELSSON
IN FRONT OF THE HEADQUARTER IN MALMÖ
WITH TURNING TORSO IN THE BACKGROUND



Financing options

Multiple business opportunities exist for Crunchfish Digital Cash. We are now engaged at a network -or CBDC- level that offer payment services for banks and other third-party payments services. Bidding for this kind of business is complex and will take time to close. In parallel, there are potential deals with individual banks or closed-loop wallets that can be secured but these are smaller deals initially. We therefore expect that we will need to secure additional financing.

Crunchfish has previously announced plans to focus its business on Digital Cash by seeking to divest the Gesture Interaction business. EY Corp Finance are engaged to identify potential buyers for Gesture Interaction and to identify strategic investors for Digital Cash. There are ongoing discussions subject to Non-Disclosure Agreements, but it is difficult to predict what the outcome will be.

As a promising alternative source of financing Crunchfish has pursued discussions with a company offering financing based on sharing of future revenues for specific projects. Such projects could be the revenues of the Crunchfish Digital Cash business or financing of a strategic acquisition. This kind of financing is non-dilutive for Crunchfish shareholders and an alternative to raising money over the stock market by means of a rights-issue of shares. Next step is to receive a term-sheet from the financing company.

The way forward

Crunchfish has a unique position in the market by offering device-agnostic trusted applications for offline use. Key market segments with demand for offline services without device dependencies are CBDC and emerging markets. We are busy making proposals for such opportunities and presenting at events to explain our technology. We need to sustain the business as it will take time before outcomes of these sales processes are known. We are therefore considering our financing options where revenue-sharing of future revenues looks most attractive. I hope to share more details soon.



Digital Cash





Partnering the world largest IT company

During Q2 Crunchfish and Tata Consultancy Services (TCS) entered into an alliance agreement targeting Central Bank Digital Currency (CBDC) projects around the world. Crunchfish will augment the TCS Quartz solution for CBDCs with offline payments capabilities. TCS is part of the Tata group, India's largest multinational business group, and has over 600,000 consultants in 55 countries.



Crunchfish and TCS entered into an alliance agreement to augment the Quartz solution for CBDCs with offline payments enabled by Crunchfish's patented Digital Cash solution. Offline payment availability is considered essential in CBDC projects to enable cash-like functionality in digital form. Crunchfish and TCS will work together to offer this combined solution for customers looking to integrate CBDCs into their business landscape. Quartz™ provides foundational technology, tools and business components that harness the power of next-generation technologies including Distributed Ledger Technology (DLT), AI/ML for organizations across varied industries. As a highly resilient technology, DLT can seamlessly integrate CBDCs with

data-intense banking operations in a secure manner and enable a retail digital payments transformation. Crunchfish complements by providing resilience on the edge by device-agnostic trusted client applications that may be used for offline payments in both CBDCs and commercial payments systems.



In May Crunchfish was engaged to perform a **security and vulnerability assessment** for a leading payment scheme. The objectives of the assessment were to identify and evaluate potential impact of vulnerabilities and to provide recommendations for risk mitigation. The vulnerability assessment was charged at approximately 325,000 SEK, whereof 25% was invoiced at project start (in Q2) and the remaining 75% after project completion (in Q3). Results of the project were presented in a comprehensive report and at a workshop on site with the customer in early July. The report and the workshop together created a basis for discussions on how Crunchfish Digital Cash can support the payment scheme to overcome identified security vulnerabilities. The first step will be to perform a Proof-of-Concept (POC) together with the payment scheme. A POC proposal has been presented to the client and is pending feedback. In parallel Crunchfish is working on a proposal for a full-fledged solution based on Digital Cash. This proposal will be finalized based on feedback on the POC proposal and then presented to the payment scheme.



The Bahamas, Jamaica, and Nigeria have already introduced CBDCs and more than 100 countries are in the exploration stage, according to the International Monetary Fund. Central bankers in the euro area, India, Brazil, China and the United Kingdom are at the forefront. Support for offline payments is pivotal for most of these projects, this was for example proven in the large offline tender from the European Central Bank (ECB) released in January. The **offline call** is budgeted by ECB at an estimated value of 220,7M EUR, and with a maximum value at 662,1M EUR.

Crunchfish's go-to-market strategy for the CBDC market is to partner with CBDC platform vendors and other relevant companies in the eco-system. The platform vendors integrate Digital Cash into their solution to be able to offer offline payment capabilities to CBDC. TCS is one example of such a partner. Together with these partners, Crunchfish is involved in numerous CBDC initiatives, where Central Banks are exploring CBDC implementations. The projects are ranging from early information collecting to formal RFIs/RFPs to pilots. The projects are normally conducted under strict confidentiality, so status information cannot be disclosed for now. Lead times are usually very long, no commercial deployments of Digital Cash for CBDC are expected during 2024 beyond for Digital Rupee.



The Digital Cash telecom functionality has after the **HarBlinger 2023 award** passed both internal quality assurance by IDFC FIRST Bank and security review by the Reserve Bank of India (RBI). An iOS version of the **IDFC FIRST Bank Digital Rupee app** has been updated with the offline capabilities and made available to IDFC customers through App Store. Android will follow during Q3. This is the first commercially deployed Digital Cash implementation, a big milestone and important reference in India, but also in the rest of the world.

Sales partner SaaS Expand Agency continues to develop customer relations in Africa, with focus on the large mobile operators. Relations have been established with several operators and some banks and e-wallets. The partnership also covers rights for SaaS Expand Agency to act as an agent in South America. A sub-agent based in the region has been engaged by SaaS Expand Agency to more efficiently explore this market.



Function before form

Retail CBDC systems are challenging to implement in practice. There are many features of cash that are desirable to replicate in digital form, such as the ability to pay offline and with privacy. These are rather novel features for digital payment systems as commercial payments systems tend not to offer offline payments and transactional privacy. This section highlights the problems of making pre-mature design decision on form without realizing its limiting consequences on the function and present the alternatives that are more suited for delivering the desired function. Defining function before form is of paramount importance for a successful implementation in practice.

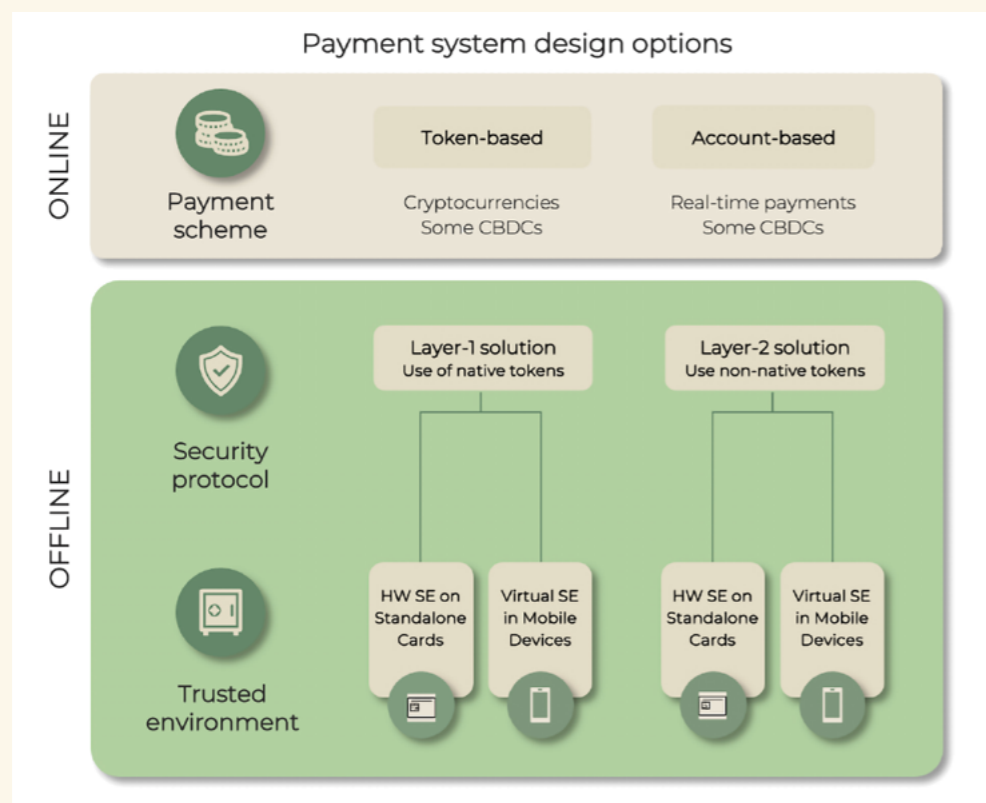


Figure: Payment system design options

Crunchfish in partnership with Lipis Advisors published during 2023 six whitepapers in a series **Enabling offline payment in an online world** with the purpose of explaining how to implement offline payments in practice from multiple angles of design, security, privacy, interoperability, scalability and trust. This diagram that was used in each of the whitepapers to describe payment system design options from both an online and an offline perspective. It serves as an illustrative backdrop here also.

The first section relates to the offline security protocol. It makes the argument for a layer-2 solution where non-native digital tokens are issued offline, instead of implementing retail CBDC as a layer-1 solution using native tokens in the form of a digital banknote. The second part related to the trusted environment on the bearer device. It outlines the many reasons why virtual secure elements are a better suited for offline payments than hardware-based secure elements in mobile devices and explains why they offer a better security than native software-based solutions.

Do not assume retail CBDC must be implemented as a digital banknote

Central banks issue physical cash. It is therefore understandable when imaging the form of retail CBDC that a digital banknote comes to mind. Albeit it is one way of implementing digital cash – the Reserve Bank of India is for instance piloting the digital rupee having fixed denominations on their digital banknotes to appear very familiar to their issued physical banknotes – it is certainly not the only way to digitize cash.

Do not assume hardware-based secure elements must be used in mobile devices

Implementing retail CBDC as digital banknotes is technically like cryptocurrencies, albeit the central bank is the guarantee of its value. Cryptocurrencies are only designed to work online though. To avoid double-spending it is necessary to consult the online ledgers that the digital token has not been spent and to be able to transfer the exact amount to the recipient and online exchange of tokens is necessary. As the function of offline payment is often a required function for retail CBDC it is important to be mindful when offline as there is no access to online ledgers or centrally issued token(s) that represent the exact payment amount.

Due to the above two fundamental differences between online and offline payments the function of offline payment should preferably not be implemented in the form of a digital banknote. Instead, offline payment is better implemented by the digital analogue of a banker's cheque. The payer funds their offline wallet by requesting and paying for a banker's cheque that can, in a trusted environment of the payer's bearer's instrument, be divided into smaller digital value tokens which total value may not exceed the total value of the requested banker's cheque. These digital value tokens are issued offline at the exact payment amount to avoid issues with returning change.

A system issuing digital value tokens offline from a trusted environment in an offline wallet is an example of a layer-2 solution. It is implemented as an overlay offline payment system, often with a separate security protocol, to the underlying layer-1 online payment solution. There are many advantages of implementing offline payments as a layer-2 solution compared to implementing a layer-1 solution. A layer-2 solution offers better privacy than layer-1 solutions as there is an exchange when funding and defunding offline wallets without any traceable token trail with the offline transactions.

A layer-2 solution is also better at providing interoperability with other domestic payments schemes or other retail CBDCs. **The Finternet as envisioned by BIS** suggests a framework for implementing globally interoperable layer-1 ledgers. Crunchfish has suggested **offline payments as globally interoperable tokens**. A layer-2 solution that complements the vision of the Finternet's globally interoperable layer-1 ledgers by enabling offline transactions to other users or merchants cross-schemes, cross-border and cross-currencies.

Do not assume hardware-based secure elements must be used in mobile devices

A common belief is that a hardware-based secure element (SE) is always more secure than software-based virtual SE because of the clarity of security boundaries. However, due to the inevitable separation between the payment app and the hardware-based SE, there is a gap in the chain of trust between the two communicating endpoints. This can result in potential attacks by replacing either endpoint with malicious ones or tampering with them and modifying their behaviour during runtime. As the hardware-based SE does not have full visibility of the payment app and the mobile OS, it cannot determine the identity of the app or whether the app has been tampered with, and must "blindly" trust the OS and the app. A trusted client application for offline payments implemented in an app-integrated virtual secure element, on the other hand, has no trust gap issues and runs securely even on rooted / jailbroken mobile devices.

BIS Handbook for Offline Payments with CBDC

The handbook for offline payments with CBDC published by the Bank of International Settlement (BIS) in May 2023 argues that offline wallets may use hardware-based, software-based approaches or a combination of both.

"The ability of user devices to protect data stored in purses is critical for offline payment solutions. Any solution will depend on the tamper resistance of the user device to protect against physical and cyber attacks. There are two types of approach, hardware-based and software-based, although combinations of both are common. Both hardware and software approaches offer several variations in how they implement tamper resistance. In all cases, the user device and purse combination must be designed to be tamper-resistant, because they will need to hold cryptographic keys and other data, such as the value-form and risk parameters, securely and perform cryptographic operations using those keys and data. Access to and exposure



of these keys or data could result in a security breach; it is therefore critical that the hardware or software make this as hard to achieve as possible.", states the handbook.

Even though the BIS offline handbook argues that both hardware-based and software-based solutions may be

used for implementing offline payments it does not provide any insights to why a software-based approach is a viable approach. It only refers to commercially available "white-box solutions", which are not secure enough for offline payments.

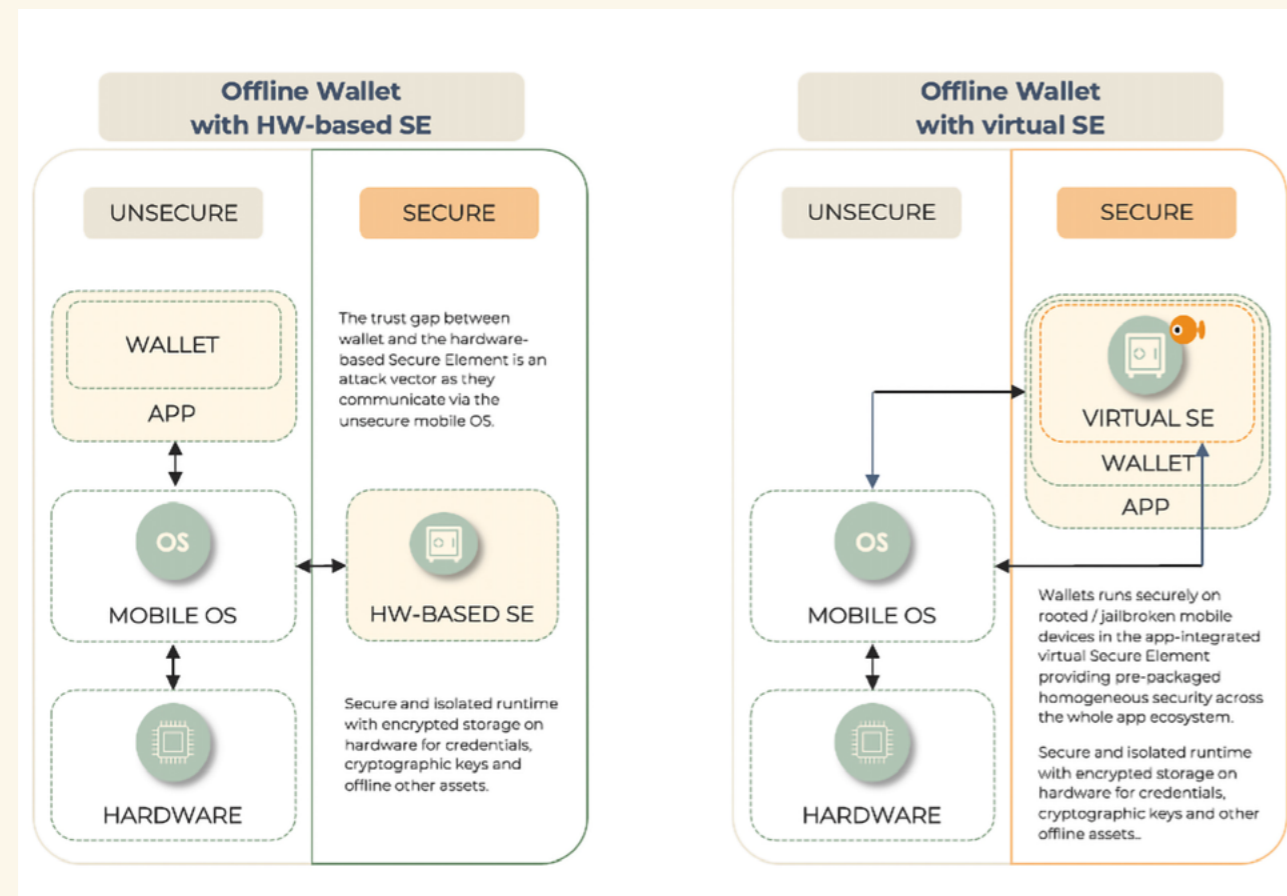


Figure: Contrasting the unsecure architecture of a wallet using a hardware-based secure element with the secure architecture of an app-integrated trusted client application in a virtual secure element.

"Software-based solutions are typically smartphone-based and use a range of software techniques to protect cryptographic keys and data both at rest and while they are being processed. Unlike hardware-based solutions, they do not require specialised components to execute their applications. Software solutions typically offer lower levels of tamper resistance than SEs or TEEs, and could use commercially available "white-box solutions" to provide tamper resistance. Software solutions would need to be separately evaluated, risk assessed and certified for assurance.", remarks the document.

This has led many central banks to assume that they need to use hardware-based security to implement offline payments

securely. This is a very unfortunate form assumption that have severe negative implications in practice and may be the single most reason why the function of offline payments has been perceived so difficult to implement in practice.

Trusted Applications in Virtual Secure Elements

Software-based virtual SEs are tamper-resistant virtual machines. They offer the required security for offline payments as they provide the required isolation by a virtualized secure runtime and encrypted storage for cryptographic keys and offline assets. This is a much higher level of security than weaker software-based protection solutions that rely on a combination of code obfuscating

and white-box cryptography. The primary weakness of such solutions is that the cryptography and runtime protection mechanisms run natively on unsecure hardware, which attackers can easily bypass. The key difference of using a virtual SE is that attackers cannot tamper with the offline wallet or bypass the protection mechanisms without first breaking the virtual SE itself. This is because the protection mechanisms for the virtual SE is implemented within the virtual SE, making it a secure solution.

Another key advantage of a virtual SE is that it is app-integrated. It is highly beneficial to provide the security as tightly coupled as possible with the application. It is a similar architecture to a standalone card where the hardware chip on the card is integrated with the applet. A trusted client application within a virtual SE has no trust gap issues with the payment app. This provides a device-agnostic, pre-packaged consistent level of security for the function of offline payments. It can even run securely on jailbroken or rooted devices as a compromised device does not affect the execution in the app sandbox.

The most important differences between implementing an offline payment on hardware-based or software-based virtual SEs are not related to security, but to all the other limiting factors that comes with using hardware-based SEs. In addition to the burden of hardware and distribution costs, a key challenge for hardware-based solutions is that there is no eco-system infrastructure available that supports the provision and upgrades of trusted applications on hardware-based SEs. Even if it is possible to run micro pilots on specific devices or on SIM-cards, such solutions are not scalable in practice. In contrast, device-agnostic trusted client applications in virtual SEs are built into the payment app itself and may be distributed and upgraded using Appstore for iPhones or Google Play for Android devices.

The Digital Euro Project

The Digital Euro project has recently published a progress report where they indicate that they are trying to address the issue. The report refers to "technical tools on the market which allow applications to be deployed remotely on the secure elements of mobile devices. These tools are commonly used for identification, telecommunications and transport purposes and could be used to deploy the offline digital euro solution too, allowing users to easily download it and use it on their mobile devices without having to go to a bank branch to identify their identity."

At the same, the European Central Bank (ECB) warns that the iPhone is "incompatible with digital currency". A board member of the ECB has even written a letter to the European Commissioner for the internal market on the issue. The issue is not that the advanced iPhone is incompatible with the digital currency. Instead, it is the use of hardware-based SEs in mobile devices that is incompatible with the desired device-agnostic function of offline payments as permission from the device manufacturer is required to use the hardware-based embedded secure elements on the mobile device. Implementing offline payments in app-integrated trusted client applications within virtual SEs, on the other hand, solves the problem as no permission is required.

Hardware-based SEs in mobile devices limit the user base of the payment application to specific devices. These can be hardware-dependant by excluding mobile devices that do not provide the required hardware-based SEs, but there is often a need to exclude users with rooted / jailbroken devices. As it is not possible to assume that all rooted / jailbroken devices can be detected, a better approach is to design an offline wallet that works securely on rooted / jailbroken devices as well. This is the case with app-integrated trusted client applications running in virtual SEs.

On rooted / jailbroken device it must be considered that an attacker has full access to the device including the file structure of the installed apps. This means that a rollback to a previous state on the phone with a higher offline balance is an obvious attack vector. It should be noted that offline payments must protect offline data that is dynamic in nature and whereas mobile applications using only static identity data for the user and is therefore less affected by rollback attacks.

Conclusion

It is a challenge to implement retail CBDC systems as there are demands for many cash-like functions that are novel to digital payments systems. To succeed it is important to not make design decisions that limit the possibility to implement the desired function. This section makes the argument that layer-2 solutions using virtual secure elements implement the cash-like features of offline payments and transactional privacy better than layer-1 solutions using hardware-based embedded secure elements.

This section was also published in the July edition of the Central Bank Payments News.



Displaying Digital Cash Through Events

Crunchfish is considered a thought leader in the space of offline payments for CBDC and commercial payment systems. To maintain and further develop this role it is important to be present at the key events in these markets. During the summer and early fall four key events are in the spotlight.



In June, Crunchfish was one of the main sponsors at the Currency Research Payments Week 2024 in Kuala Lumpur. With a focus on CBDC, the event attracts central bankers from across the world, together with industry players, researchers, journalists and other important stakeholders. During the five days long event Crunchfish were exhibiting Digital Cash and CEO Joachim Samuelsson hosted a practical CBDC workshop and gave a plenary session about Innovation. Privacy is an area that has not been explored deeply for CBDC systems, yet it is key for public adoption of digital currencies. Furthermore, public adoption is

contingent also on device-agnostic mobile applications. In the practical CBDC workshop, Crunchfish Joachim Samuelsson outlined practical considerations on how privacy may be implemented in CBDC systems and demonstrated innovation that balances the public's need for true privacy with regulatory requirements for transactional traceability and presented the case for device-agnostic trusted client applications.

End of August marks the time for the **Global Fintech Fest** (GFF) in Mumbai. GFF is the largest fintech conference in India, organized annually by the **Payments Council of India** (PCI), the **National Payments Corporation of India** (NPCI), and the **Fintech Convergence Council** (FCC). Crunchfish will host a strategically placed booth to exhibit its device-agnostic trusted client application platform for offline payments, tokenized card payments as well as other mobile client / server systems.



September 10-12, the team of Crunchfish will go the **CBDC Conference** in Istanbul to exhibit Digital Cash for central bankers and the CBDC industry. CEO Joachim Samuelsson will participate in four different sessions:

- Plenary speech about "Function before form: Assumptions to avoid when designing retail CBDC systems."
- Track session on "Enabling device-agnostic trusted client applications for offline payments in retail CBDC systems."

- CBDC Academy describing "Offline payments and true privacy in retail CBDC systems"
- Panel discussion on "Offline Payment with CBDC".



End of September Crunchfish turns to London and the **Digital Currency Conference** organized by Currency Research. Crunchfish will exhibit Digital Cash and CEO Joachim Samuelsson will participate in a plenary session.





Gesture Interaction



***Touchless interaction
enables users to
interact with devices
without touching
displays or physical
buttons.***



Reaching a new level with XR Skeleton 3.0

Communicated in Q1, Crunchfish together with its Board of Directors took a decision **to explore a divestment of the Crunchfish Gesture Interaction subsidiary**. As a consequence of this plan, Fredrik Clementson, CEO of Crunchfish Gesture Interaction, left the company in May. Due to this, sales activities are mainly focused around existing customer engagements to make sure they are maintained and fulfilled.



Market Overview

In May Crunchfish Gesture Interaction communicated the **signing of a commercial follow-up agreement with OPPO Mobile Telecommunications** – one of the largest mobile phone manufacturers in the world – wrapping up the collaboration around pose detection software in their mobile devices. The contract had a value of 1.5 million SEK and was invoiced and booked in March 2024. OPPO signed an agreement in November 2022 at a value of US\$500,000 for the use of Crunchfish's gesture control software for pose detection in their devices. This new agreement marks the completion of this Crunchfish product, which has been installed and shipped with millions of mobile devices by OPPO.

During the second quarter another existing customer extended the scope of their current software license agreement to also include the latest version of XR Skeleton. The addendum brings Crunchfish Gesture Interaction a one-time license fee of \$25,000 and a yearly support fee of \$15,000. The license fee was invoiced and booked in June and the first-year support fee will be invoiced and booked during Q3.

Technical Developments



In early June, **Crunchfish released the third generation of its XR Skeleton flagship product**. With the release of XR Skeleton 3.0 to the market, Crunchfish now has a unifying product offering for achieving state of the art hand tracking and gesture support in AR/VR/XR products. It combines earlier product versions for Mono and Stereo into one new powerful platform, making it easier and more flexible for customers and integrators. The new release also overcomes some earlier limitations such as requiring stereo overlap. In addition, the new API supports flexible camera setups for both placement as well as camera internals, so that a wide variety of devices can be addressed using the same product platform. Integration of XR Skeleton 3.0 is currently ongoing in a project together with a customer for their new mixed reality glasses.



Offered alongside XR Skeleton 3.0 and released together is support for OpenXR hand tracking. OpenXR is an open standard developed by the Khronos Group designed to provide a unified interface for virtual reality (VR) and augmented reality (AR) applications across different hardware and platforms. The standard has become widely adopted by the industry, allowing developers to write code once and run it across multiple VR and AR platforms and devices, reducing the need for platform-specific adaptation. Before OpenXR, developers had to use custom adaptations for each vendor, thus reducing the number of devices that an application could be targeted for.



By supporting the OpenXR standard, Crunchfish opens the hand tracking technology to a broader community of developers. Customers can provide support for OpenXR on their devices and leverage the latest advancements in hand tracking technology available in XR Skeleton 3.0.



Crunchtunes - Curious, Creative and Caring

Crunchfish's core values are Curious, Creative and Caring. Generative AI is gaining more and more adoption and becomes an essential tool for companies. To manifest Curious and Creative at Crunchfish, COO Patrik Lindeberg, a.k.a. DJ Lindeberg, took help from the AI tool **Udio** to create tunes which tie to happenings and important news at Crunchfish. Every Friday during the spring, a new Crunchtune highlighted the best of the past week, from a Crunchfish perspective. Some of the Crunchtunes also bring Caring to staff, partners and other friends of Crunchfish.



The first 12 Crunchtunes are collected in the album Crunchtunes Spring Edition 2024, available at [Spotify](https://www.crunchfish.com/communications/crunchtunes/) and <https://www.crunchfish.com/communications/crunchtunes/>.

<p>#01 - DIGITAL CASH FRIDAY VIBES April 12th</p> <p>The first Crunchtune was an experiment, a sign of the Curiousness and Creativity that is the core of Crunchfish. But it also gave birth to an idea, to create a melody every Friday to sum up the week, to give boost to a press release or to highlight something in the Crunchfish world.</p>	<p>#02 - AN ACE ALWAYS WINS April 19th</p> <p>The second Crunchtune – An Ace Always Wins – goes in euro-disco style and marked the week's release of the whitepaper – ACE the Future of Mobile Card Payments.</p>	<p>#03 - PAY BY A WHISPER April 26th</p> <p>To remind about the important PR drop this week – Crunchfish provides and patents Digital Cash privacy – Crunchtune #03 goes in gangsta hip hop style.</p>
<p>#04 - OUR FINAL GESTURE IS A WAVE GOODBYE – May 3rd</p> <p>This week we gave thanks to Fredrik Clementson having his last day after a 10-month tenure as CEO of Crunchfish Gesture Interaction. The 4th Crunchtunes goes in smooth Boyzone style to celebrate Fredrik.</p>	<p>#05 - ALL ABOUT TRUST May 10th</p> <p>A power ballad, to align with the Eurovision week in Malmö, on the obvious theme of the week – Trust – to highlight that Crunchfish patents device-agnostic trusted client applications for offline use cases.</p>	<p>#06 - DIGITAL CASH REBELLION May 17th</p> <p>As a tribute to Crunchfish's Chairman Göran Linder who had the view that the first five Crunchtunes were too soft, and to push for the annual general assembly.</p>
<p>#07 - THE MORE WE CREATE, THE MORE WE INNOVATE – May 24th</p> <p>This week was very busy with the release of the Q1 report, interviews about the Q1 report, annual meeting and a lunch to lunch Workshop at Grand Hotel Mölle. The Workshop was a great success where the intense discussions were accompanied by the beauty of Kullaberg. Crunchtunes #07 captured the moment with the first Reggae tune.</p>	<p>#08 - BLUES FOR THE SECURITY EXPERTS May 31st</p> <p>Crunchfish, the Blues Brothers of the payment industry is celebrated by Crunchtune #08 – Blues for security experts. It points to the important announcement that Crunchfish was awarded to perform a security assessment for a leading payment scheme.</p>	<p>#09 - PREACHER SAMUELSSON ON A MISSION - June 7th</p> <p>The ninth Crunchtune was dedicated to CEO Joachim Samuelsson's world tour of Asia, visiting Mumbai, Singapore and Kuala Lumpur, starting from Amsterdam.</p>
<p>#10 - CURRENCY RESEARCH SHINES IN KL June 12th</p> <p>Crunchfish wanted to say a heartfelt thank you to Currency Research for the warm hospitality arranging the Payments Week 2024 in Kuala Lumpur.</p>	<p>#11 - CRUNCHFISH BRINGS WARM DAYS June 20th</p> <p>Summer solstice is a very special day in Sweden. As daylight is scarce in the winter Swedish people enjoy the summer season immensely when the sun sets very late in the evenings. Daylight is at its peak and on the closest Friday we celebrate Midsummer.</p>	<p>#12 - A TOAST TO OUR BRIGHT MINDS June 28th</p> <p>Crunchfish had a great spring with many milestones achieved. The engine is the many brilliant minds working with Digital Cash and Gesture Interaction. Crunchtune #12 was dedicated to these bright minds. Their dedication to the success of Crunchfish is evidenced by 20 subscribing to the new incentive program TO2024/2028.</p>



Significant news during and after Q2



Crunchfish group

2024-06-27

The **interest in the 2024/2028 warrant programme** for employees and key resources was strong. Some warrants from the 2022/2026 programme were repurchased and the warrants in the 2020/2024 programme are about to expire without value.

2024-05-21

Crunchfish **published the Q1 Report 2024**, and **held a webinar about it and the equity analysis**, where Crunchfish CEO Joachim Samuelsson was interviewed by analyst Axel Dahlman from Västra Hamnen Corporate Finance.

2024-04-11

Crunchfish **published the Annual Report 2023**, and **held a webinar about it**, where Crunchfish CEO Joachim Samuelsson was interviewed by analyst Axel Dahlman from Västra Hamnen Corporate Finance. The interview is in Swedish.

Digital Cash

2024-07-29

Crunchfish **released a new white paper** as part of the series "Practical Guides to Offline Payments", with the title "Function Before Form: Assumptions to Avoid When Designing Retail CBDC Systems."

2024-07-01

Crunchfish **received US patent** for the initial fundamental Digital Cash innovation.

2024-07-01

Crunchfish and Tata Consultancy Services **entered alliance agreement** to offer offline payments for CBDCs.

2024-06-12

Crunchfish **announced and patented** Digital Cash programmability.

2024-06-05

Following the series "Device-agnostic Trusted Client Applications", Crunchfish **released a new white paper** with the title "Enabling Device-Agnostic Trusted Client Applications".

2024-05-29

Crunchfish having world-leading expertise to deliver device agnostic trusted client applications was **engaged to conduct a security and vulnerability assessment** for a prominent payment service.

2024-05-28

Crunchfish **released a new white paper** as part of the series "Practical Guides to Offline Payments", with the title "Privacy Considerations in CBDC Systems."

2024-05-03

Crunchfish **applied for a strategically important and broad patent**, protecting the use of device-agnostic trusted client applications for offline use cases in any mobile client / server system.

2024-04-24

Crunchfish **released an upgraded version of the Digital Cash SDK** which enables privacy by design for offline payments in CBDC and commercial payment systems.

2024-04-15

Crunchfish **introduced App-integrated Card Emulation (ACE)** offering the security of Mobile Card Emulation (MCE) without sacrificing the scalability provided by tokenized card payments with Host-based Card Emulation (HCE).

2024-04-08

Crunchfish **received positive patentability report** for quantum-safe Digital Cash.

Gesture Interaction

2024-06-03

Crunchfish Gesture Interaction **announced a new generation of the XR Skeleton** flagship product. The new version combines earlier products for single and stereo cameras into one powerful product.

2024-05-20

Crunchfish Gesture Interaction **signed a commercial follow-up agreement with OPPO** Mobile Telecommunications wrapping up the collaboration around pose detection software in their mobile devices.



Financials



Financial report

Sales and earnings for the 2nd quarter

Net sales amounted to SEK 432 (295) thousand for the second quarter and operating expenses amounted to SEK 13,166 (13,867) thousand. EBITDA for the period amounted to SEK -5,867 (-7,620) thousand. Loss before tax for the second quarter amounted to SEK -7,935 (-8,639) thousand and has been charged with amortization of intangible assets of SEK 710 (1,221) thousand and tangible fixed assets of SEK 76 (53) thousand and with impairment om of intangible assets of SEK 1,286 (0) thousand.

Sales and earnings for the half year

Net sales amounted to SEK 2,097 (465) thousand for the period and operating expenses amounted to SEK 25,977 (25,378) thousand. EBITDA for the period amounted to SEK --9,787 (-13,352) thousand. Loss before tax for the period amounted to SEK -14,190 (-15,468) thousand and has been charged with amortization of intangible assets of SEK 1,451 (2,198) thousand and tangible fixed assets of SEK 197 (116) thousand and with impairment om of intangible assets of SEK 2,793 (0) thousand.

Investments

During the second quarter, the Group invested SEK 4,159 (4,163) thousand in intangible fixed assets and SEK 0 (591) thousand in tangible fixed assets.

During the first half year, the Group invested SEK 8,423 (8,267) thousand in intangible fixed assets and SEK 0 (591) thousand in tangible fixed assets.

Liquidity and financing

At the end of the second quarter the Group's cash and cash equivalents amounted to SEK 12,503 (9,130) thousand. Cash flow from operating activities during the second quarter amounted to SEK -5,247 (-5,922) thousand.

Staff

As of June 30th, 2024, the number of employees was 21 (22).

Risks and uncertainties

A number of different risk factors could impact Crunchfish's operations and industry negatively. It is therefore very important to consider relevant risks in addition to the Company's growth opportunities. Relevant risks are presented in the prospectus issued by Crunchfish AB in October 2023 and the annual report for FY 2023, which can be found at [crunchfish.com](https://www.crunchfish.com).

Related party transactions

Company management and administrative staff are employed in the parent company Crunchfish AB. Reported sales in the parent company consists of income from services rendered for management and administration of the company's two subsidiaries.

Sales and earnings for the quarter, parent company

The parent company's net sales amounted to SEK 4,146 (4,803) thousand for the second quarter and operating expenses to amounted to SEK -4,883 (-5,140) thousand. EBITDA for the period amounted to SEK -115 (182) thousand. During the second quarter, the parent company invested SEK 0 (0) thousand in intangible fixed assets and SEK 0 (0) thousand in tangible fixed assets.

Sales and earnings for the half year parent company

The parent company's net sales amounted to SEK 8,319 (9,111) thousand for the period and operating expenses to amounted to SEK -9,405 (-9,897) thousand. EBITDA for the period amounted to SEK 119 (164) thousand. During the period, the parent company invested SEK 0 (0) thousand in intangible fixed assets and SEK 0 (0) thousand in tangible fixed assets.



Major shareholders for Crunchfish AB (publ) as of June 30th 2024

Name	Number of shares	Share %
Femari Invest AB (CEO Joachim Samuelsson & Petra Samuelsson)	7 500 000	18.92
Corespring Invest AB (Chairman Göran Linder)	6 953 182	17.54
Nordic Underwriting ApS	2 316 995	5.84
Paul Cronholm (Founder & CTO)	1 101 601	2.78
Carlquist Holding AB	900 000	2.27
Mikael Kretz incl. company holdings	760 000	1.92
Håkan Paulsson incl. family and company holdings	625 000	1.58
Mats Kullenberg incl. company holdings	589 339	1.49
Lars Andreasson incl. family holdings	500 000	1.26
Granitor Invest AB	419 757	1.06
Total, ten largest shareholders	21 665 874	54.65
Other shareholders (approx. 6,000)	17 981 032	45.35
Total	39 646 906	100.00

Share price development during 6 months



Financial calendar

Crunchfish AB publishes financial reports after each quarter. Upcoming reports are planned to be published according to the schedule below:

Half-year report 2024

August 23rd, 2024, 8:30 am CET

Interim report Q3 2024

November 13th, 2024, 8:30 am CET

Year-end report 2024

February 13th, 2025, 8:30 am CET

Accounting principles

This report has been drafted according to the Annual accounts act (Årsredovisningslagen) and BFNAR 2012:1 (K3).

Auditor's review

This report has not been subject to review by the company's auditor.

Company information

Crunchfish AB (publ), corporate registration number 556804-6493, is a limited company seated in Malmö, Sweden.

Certified Adviser

Västra Hamnen Corporate Finance AB is the company's Certified Adviser.

E-mail: ca@vhcorp.se

Phone: +46 40 200 250

Further information

For further information, please contact:

Joachim Samuelsson, CEO

ir@crunchfish.com

Crunchfish AB (publ)

Stora Varvgatan 6A

211 19 Malmö

Statement by the Board of Directors and the CEO

The Board of Directors and the CEO hereby assures that this interim report gives a fair overview of the company's operations, financial status, and result.

Malmö, August 23rd, 2024

The Board of Directors:

Göran Linder (chairman)

Susanne Hannestad

Joakim Nydemark

Birendra Sahu

Joachim Samuelsson (CEO)

Malte Zaunders

This information is information that Crunchfish AB is obliged to publish in accordance to the EU Market Abuse Regulation. The information was provided by the contact person above for publication on August 23rd, 2024.



Group income statement (SEK)

	Q2 2024	Q2 2023	Q1-Q2 2024	Q1-Q2 2023	2023
Operating income					
Net sales	431 893	294 731	2 097 231	465 303	987 834
Own work capitalized	4 159 236	4 162 896	8 423 407	8 266 892	16 473 949
Other operating income	635 467	515 329	1 228 029	980 067	2 089 237
Total operating income	5 226 596	4 972 956	11 748 667	9 712 262	19 551 020
Operating expenses					
Other external expenses	-4 579 310	-5 999 339	-8 753 671	-10 313 967	-19 691 267
Personnel expenses	-6 428 036	-6 593 884	-12 712 960	-12 748 089	-25 076 057
Depreciation of tangible and intangible fixed asset	-2 071 883	-1 274 161	-4 441 362	-2 313 652	-22 847 399
Other operating expenses	-86 386	0	-86 386	-2 286	-1 327 509
Loss from participations in associated companies	0	0	17 230	-340	-1 422
Total operating expenses	-13 165 615	-13 867 384	-25 977 149	-25 378 334	-68 943 654
Operating profit	-7 939 019	-8 894 428	-14 228 482	-15 666 072	-49 392 634
Financial items					
Other interest income and similar profit items	28 986	263 684	79 919	265 833	274 708
Interest expense and similar loss items	-24 583	-8 501	-41 036	-67 365	-186 674
Profit or loss from financial items	4 403	255 183	38 883	198 468	88 034
Profit or loss after financial items	-7 934 616	-8 639 245	-14 189 599	-15 467 604	-49 304 600
Profit or loss before tax	-7 934 616	-8 639 245	-14 189 599	-15 467 604	-49 304 600
Taxes					
Tax on income for the period	0	0	0	0	0
Profit or loss for the period/year	-7 934 616	-8 639 245	-14 189 599	-15 467 604	-49 304 600
Key figures					
EBITDA	-5 867 136	-7 620 267	-9 787 120	-13 352 420	-26 545 235
Earnings per share	-0,20	-0,26	-0,36	-0,47	-1,46
Number of shares, average	39 646 906	33 039 167	39 646 906	33 039 167	33 865 134
Number of shares at balance sheet date	39 646 906	33 039 167	39 646 906	33 039 167	39 646 906
Earnings per share after full dilution	-0,20	-0,26	-0,36	-0,47	-1,46
Number of shares after full dilution, average	41 059 706	34 672 967	41 059 706	34 672 967	35 239 634
Number of shares after full dilution, balance sheet date	41 059 706	34 672 967	41 059 706	34 672 967	41 021 406



Group balance sheet (SEK)

	Jun 30, 2024	Jun 30, 2023	Dec 31, 2023
Assets			
Fixed assets			
Intangible assets			
Capitalized expenses for development work	30 312 448	39 578 267	26 132 777
Total intangible fixed assets	30 312 448	39 578 267	26 132 777
Tangible fixed assets			
Equipment	1 035 941	1 010 522	1 449 809
Total tangible fixed assets	1 035 941	1 010 522	1 449 809
Financial assets			
Participation in associated companies	0	68 313	67 231
Total financial assets	0	68 313	67 231
Total fixed assets	31 348 389	40 657 102	27 649 817
Current assets			
Current receivables			
Account receivables	389 186	565 814	48 941
Other receivables	1 717 417	778 079	1 951 018
Prepayments and accrued income	1 723 955	1 528 593	1 139 804
Total current receivables	3 830 558	2 872 486	3 139 763
Cash and bank balances			
Cash and bank balances	12 503 395	9 129 869	30 725 483
Total cash and bank balances	12 503 395	9 129 869	30 725 483
Total current assets	16 333 953	12 002 355	33 865 246
Total assets	47 682 342	52 659 457	61 515 063



Group balance sheet cont. (SEK)

	Jun 30, 2024	Jun 30, 2023	Dec 31, 2023
Equity and liabilities			
Equity			
Equity attributable to parent company shareholders			
Share capital	1 823 758	1 519 802	1 823 758
Other contributed capital	318 472 506	276 128 560	318 492 646
Other capital including profit or loss for the period	-282 243 883	-234 217 288	-268 054 284
Total equity	38 052 381	43 431 074	52 262 120
Long-term liabilities			
Lease liabilities	857 381	486 630	957 492
Total long-term liabilities	857 381	486 630	957 492
Current liabilities			
Lease liabilities	197 525	423 964	460 031
Accounts payable	1 191 805	1 071 446	1 046 542
Other liabilities	849 530	1 091 560	784 093
Accrued expenses and accrued income	6 533 720	6 154 783	6 004 785
Total current liabilities	8 772 580	8 741 753	8 295 451
Total equity and liabilities	47 682 342	52 659 457	61 515 063
Key Figures			
Equity-assets-ratio	79,8%	82,5%	85,0%
Debt-to-equity ratio	0,5%	1,0%	2,7%
Interest-bearing net debt	n/a	n/a	n/a

Changes in the group equity (SEK)

	Q2 2024	Q2 2023	Q1-Q2 2024	Q1-Q2 2023	2023
Equity at beginning of period/year	46 007 907	52 073 099	52 262 120	58 771 444	58 771 444
Translation difference	-20 910	-2 780	-20 140	-2 780	-41 360
Share issues	0	0	0	0	51 209 977
Issue costs	0	0	0	0	-8 503 355
Warrant premiums	0	0	0	130 014	130 014
Profit or loss for the period/year	-7 934 616	-8 639 245	-14 189 599	-15 467 604	-49 304 600
Equity at end of period /year	38 052 381	43 431 074	38 052 381	43 431 074	52 262 120



Group cash flow statement (SEK)

	Q2 2024	Q2 2023	Q1-Q2 2024	Q1-Q2 2023	2023
Operating activities					
Operating profit or loss	-7 939 019	-8 894 428	-14 228 482	-15 666 072	-49 392 634
Adjustments for non-cash items	2 050 280	1 274 165	4 487 509	2 313 992	24 128 377
Interest received etc.	9 285	36 386	10 176	38 535	58 428
Interest paid	-18 209	-8 564	-34 662	-32 253	-151 488
Income tax paid	0	0	0	0	0
Cash flow from operating activities before changes in working capital	-5 897 663	-7 592 441	-9 765 459	-13 345 798	-25 357 317
Cash flow from changes in working capital					
Decrease(+)/increase(-) in receivables	717 777	424 736	-690 795	214 802	-52 475
Decrease(-)/increase(+) in current liabilities	-67 315	1 246 011	739 635	980 118	497 749
Cash flow from operating activities	-5 247 201	-5 921 694	-9 716 619	-12 150 878	-24 912 043
Investing activities					
Investments in technology development	-4 159 236	-4 162 896	-8 423 407	-8 266 892	-16 473 949
Investments in equipment	0	-591 453	0	-591 453	-1 232 856
Cash flow from investing activities	-4 159 236	-4 754 349	-8 423 407	-8 858 345	-17 706 805
Financing activities					
Share issue	0	0	0	0	42 706 622
Loans from shareholders	0	0	0	0	7 500 000
Repayment loans from shareholders	0	0	0	0	-7 500 000
New loans financial leasing agreements	0	591 453	0	591 453	1 232 856
Amortization of financial leasing agreements	-88 815	-39 527	-145 431	-64 344	-198 818
Warrant premiums paid	0	0	0	130 014	130 014
Cash flow from financing activities	-88 815	551 926	-145 431	657 123	43 870 674
Change in cash and cash equivalents	-9 495 252	-10 124 117	-18 285 457	-20 352 100	1 251 826
Cash and cash equivalents at beginning of period/year	21 985 320	19 029 405	30 725 483	29 292 563	29 292 563
Exchange rate difference in cash and cash equivalents	13 327	224 581	63 369	189 406	181 094
Cash and cash equivalents at end of period/year	12 503 395	9 129 869	12 503 395	9 129 869	30 725 483



Parent company income statement (SEK)

	Q2 2024	Q2 2023	Q1-Q2 2024	Q1-Q2 2023	2023
Operating income					
Net sales	4 145 957	4 803 416	8 318 831	9 110 834	17 240 870
Other operating income	619 036	515 329	1 199 796	944 682	2 053 852
Total operating income	4 764 993	5 318 745	9 518 627	10 055 516	19 294 722
Operating expenses					
Other external expenses	-2 701 870	-2 724 076	-5 425 548	-4 861 293	-9 958 369
Personnel expenses	-2 091 342	-2 412 994	-3 887 361	-5 027 693	-8 818 661
Depreciation of tangible and intangible fixed asset	-3 010	-3 010	-6 020	-6 020	-12 040
Other operating expenses	-86 386	0	-86 386	-2 286	-2 286
Total operating expenses	-4 882 608	-5 140 080	-9 405 315	-9 897 292	-18 791 356
Operating profit	-117 615	178 665	113 312	158 224	503 366
Financial items					
Profit/loss from participation in group companies	-2 740 000	0	-4 740 000	0	-48 176 713
Other interest income and similar profit items	88 367	334 329	129 605	357 211	866 680
Interest expense and similar loss items	-29 962	-994	-49 170	-36 220	-138 140
Profit or loss from financial items	-2 681 595	333 335	-4 659 565	320 991	-47 448 173
Profit or loss after financial items	-2 799 210	512 000	-4 546 253	479 215	-46 944 807
Profit or loss before tax	-2 799 210	512 000	-4 546 253	479 215	-46 944 807
Taxes					
Tax on income for the period	0	0	0	0	0
Profit or loss for the period/year	-2 799 210	512 000	-4 546 253	479 215	-46 944 807
Key figures					
EBITDA	-114 605	181 675	119 332	164 244	515 406
Earnings per share	-0,07	0,02	-0,11	0,01	-1,39
Number of shares, average	39 646 906	33 039 167	39 646 906	33 039 167	33 865 134
Number of shares at balance sheet date	39 646 906	33 039 167	39 646 906	33 039 167	39 646 906
Earnings per share after full dilution	-0,07	0,01	-0,11	0,01	-1,32
Number of shares after full dilution, average	41 059 706	34 672 967	41 059 706	34 672 967	35 239 634
Number of shares after full dilution, balance sheet date	41 059 706	34 672 967	41 059 706	34 672 967	41 021 406



Parent company balance sheet (SEK)

	Jun 30, 2024	Jun 30, 2023	Dec 31, 2023
Assets			
Fixed assets			
Tangible fixed assets			
Equipment	33 079	45 119	39 099
Total tangible fixed assets	33 079	45 119	39 099
Financial assets			
Participations in group companies	120 558 538	123 057 790	121 798 538
Receivables from group companies	14 301 006	21 935 612	0
Total financial assets	134 859 544	144 993 402	121 798 538
Total fixed assets	134 892 623	145 038 521	121 837 637
Current assets			
Current receivables			
Account receivables	37 817	565 814	48 941
Receivables from group companies	0	443 955	0
Other receivables	454 110	0	757 005
Prepayments and accrued income	1 306 203	1 254 979	1 128 561
Total current receivables	1 798 130	2 264 748	1 934 507
Cash and bank balances			
Cash and bank balances	11 467 580	7 789 595	29 789 506
Total cash and bank balances	11 467 580	7 789 595	29 789 506
Total current assets	13 265 710	10 054 343	31 724 013
Total assets	148 158 333	155 092 864	153 561 650



Parent company balance sheet cont. (SEK)

	Jun 30, 2024	Jun 30, 2023	Dec 31, 2023
Equity and liabilities			
Equity			
Restricted equity			
Share capital	1 823 758	1 519 802	1 823 758
Total restricted equity	1 823 758	1 519 802	1 823 758
Unrestricted equity			
Profit brought forward	144 629 474	149 171 615	191 574 281
Profit or loss for the period/year	-4 546 253	479 215	-46 944 807
Total unrestricted equity	140 083 221	149 650 830	144 629 474
Total equity	141 906 979	151 170 632	146 453 232
Current liabilities			
Accounts payable	389 242	463 188	643 293
Liabilities to group companies	2 142 868	0	3 500 000
Other liabilities	737 562	953 748	560 617
Accrued expenses and accrued income	2 981 682	2 505 296	2 404 508
Total current liabilities	6 251 354	3 922 232	7 108 418
Total equity and liabilities	148 158 333	155 092 864	153 561 650
Key Figures			
Equity-assets-ratio	95,8%	97,5%	95,4%
Debt-to-equity ratio	0,0%	0,0%	0,0
Interest-bearing net debt	n/a	n/a	n/a

Changes in parent company equity (SEK)

	Q2 2024	Q2 2023	Q1-Q2 2024	Q1-Q2 2023	2023
Equity at beginning of period/year	144 706 189	150 658 632	146 453 232	150 561 403	150 561 403
Share issues	0	0	0	0	51 209 977
Issue costs	0	0	0	0	-8 503 355
Warrant premiums	0	0		130 014	130 014
Profit or loss for the period/year	-2 799 210	512 000	-4 546 253	479 215	-46 944 807
Equity at end of period /year	141 906 979	151 170 632	141 906 979	151 170 632	146 453 232



Parent company cash flow statement (SEK)

	Q2 2024	Q2 2023	Q1-Q2 2024	Q1-Q2 2023	2023
Operating activities					
Operating profit or loss	-117 615	178 665	113 312	158 224	503 366
Adjustments for non-cash items	3 010	3 010	6 020	6 020	12 040
Interest received etc.	68 666	109 724	84 030	132 606	650 400
Interest paid	-29 962	-983	-49 170	-1 108	-103 028
Income tax paid	0	0	0	0	0
Cash flow from operating activities before changes in working capital	-75 901	290 416	154 192	295 742	1 062 778
Cash flow from changes in working capital					
Decrease(+)/increase(-) in receivables	1 489 692	-43 602	136 377	584 481	914 722
Decrease(-)/increase(+) in current liabilities	443 464	219 721	500 068	16 267	-297 547
Cash flow from operating activities	1 857 255	466 535	790 637	896 490	1 679 953
Investing activities					
Loans provided to group companies	-10 431 066	-11 143 433	-19 158 138	-21 935 612	-43 417 461
Cash flow from investing activities	-10 431 066	-11 143 433	-19 158 138	-21 935 612	-43 417 461
Financing activities					
Share issue	0	0	0	0	42 706 622
Loans from shareholders	0	0	0	0	7 500 000
Repayment loans from shareholders	0	0	0	0	-7 500 000
Warrant premiums paid	0	0	0	130 014	130 014
Cash flow from financing activities	0	0	0	130 014	42 836 636
Change in cash and cash equivalents	-8 573 811	-10 676 898	-18 367 501	-20 909 108	1 099 128
Cash and cash equivalents at beginning of period/year	20 021 690	18 241 899	29 789 506	28 509 210	28 509 210
Exchange rate difference in cash and cash equivalents	19 701	224 594	45 575	189 493	181 168
Cash and cash equivalents at end of period/year	11 467 580	7 789 595	11 467 580	7 789 595	29 789 506

