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in time, power consumption or in electromagnetic fields caused by the execution. This variance is known as 'side-channel leakage' and the data is then used to optimise fraudulent inputs.

Again, sophisticated algorithms form the main point of defence. The trend here is to develop sensors that are capable of conducting the entire feature extraction and matching process within the Secure Element itself, without the need for an additional processor. This progression is a major technical advance. SEs remain one of the most robust hardware security solutions available, and consolidating the process into the SE eliminates many points of risk in the data flow.

Ready to roll

In summary, on-card biometric authentication is a natural evolution for contactless card payments. These cards offer an answer to fraud fears and security requirements, without impairing the convenience of paying with a ‘tap’. However, ensuring that robust security and privacy protections are in place is still fundamental to the launch and successful mass adoption of any new technology – especially when it comes to payments!

Biometric solutions can provide this security both through the quality of the biometric processing itself, and the protection and storage of assets such as the sensor image and templates. The R&D work already done, and feedback from over 20 global trials and commercial launches so far, mean that modern biometric payment card sensors deliver the required high-quality software and algorithms, and more robust protection of sensitive biometric data. By adding biometric authentication to contactless payments, the financial world can finally eradicate the need for PIN entry and remove contactless payment limits, enabling a consistent, simple and hygienic payment experience.

About the author

Henrik Nilsson is the director of product management at Fingerprint Cards, responsible for the company’s biometric offering in the payment and access segments. Since joining Fingerprint in 2013, Henrik has collaborated with customers to optimise biometric products across the mobile, PC and IoT space. He holds a BSc in Economics and an MSc in Electrical Engineering from Lund University and has extensive industry experience, having previously held roles at Ericsson and ST Ericsson.

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How biometrics can help airlines take off again

We speak to SITA director Peter Sutcliffe about the role biometric technology can play, as airlines and airports progressively resume their operations following the Covid-19 pandemic.

BTT: SITA has said that smart biometric technology is fundamental for airports and airlines to safely resume their operations following the Covid-19 emergency. Why is it so vital?

Peter Sutcliffe: Airports and airlines – along with other ports and carriers in the wider travel industry – face an extraordinary challenge.

Covid-19 has transformed the air transport industry. 9/11 brought security to the forefront of air travel, but with Covid health is the new priority in the return to the skies. We are now seeing some recovery in air travel, but the challenges of implementing shifting travel corridors and the re-opening of borders requires more agile operations that can respond to changing policy, often at short notice. The financial pressures the industry is facing are vast and the need to contain costs – to do more for less – is critical. Greater efficiencies and agility will depend on accelerating automation and technology, to keep air travel attractive and commercially viable.

Biometrically linked identities – where your face is your boarding pass, for example – is one of the fundamental technologies that will support carriers and ports in resuming their activities more efficiently. This will also help build confidence with travellers, and improve identity assurance to support traditional security needs while managing health risks. But the use of biometric technology alone will bring limited benefits for airports and carriers. The benefits are more far-reaching when biometric technology is combined with other technologies to provide greater identity integration, traveller automation and self-service.

BTT: The air industry is under major financial pressure, following the drop in global travel caused by the pandemic. How can airlines and airports be expected, or persuaded, to invest in expensive new biometric tech in these circumstances?

Peter Sutcliffe: It is certainly not an easy time for the industry. SITA is acutely aware of the challenges that airlines and airports are experiencing. However, all industry stakeholders recognise that countries can restart travel safely and efficiently. Real savings can be made in the long term with the right solutions to support the recovery. One of the first steps we recommend is that airlines and airports undertake a cost-benefit analysis and a risk assessment into whether an investment is justified. As part of this analysis, considerations would include the likely scenarios around the industry’s direction over the next 10 years.

For example, we know that the International Civil Aviation Organisation

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(ICAO) is developing its ‘Digital Travel Credential’ concept currently, and other biometric digital identity models are being adopted across industries. There will also be a growing expectation of seamless processes – which biometric technology can help facilitate – industry-wide, sponsored by industry authorities and governments. Organisations can begin remodelling their operations now, start realising savings in the near term, and prepare for inevitable changes on the way, with future-proofed solutions.

From a risk perspective, we do not want to see crowded airport spaces, and queues at check-in counters, boarding gates and in arrival halls. So, fast automation, off-airport processing, self-service and government collaboration are a priority in response to Covid-19 now, and to handle passenger volumes when they recover – IATA predicts that passenger traffic will return to pre-pandemic levels in 2024.

Biometric technology and the off-airport enablement of existing government and industry processes can effectively build more confidence in travellers and governments and accelerate recovery. Our SITA Travel Authorisation solution, for instance, enables travellers to provide and fulfil government requirements for travel before leaving for the airport. This potentially avoids putting others at risk – such as other passengers and those working in the airport. A touchless arrival process can be rolled out by pre-loading airport biometric systems with the appropriate and consented biometrics provided.

“**The International Civil Aviation Organisation is now developing its ‘Digital Travel Credential’ concept, and other biometric digital identity models are being adopted across other industries”**

The ideal scenario for airports and airlines would be to integrate biometric technology into their existing check-in processes and shared common-use infrastructure to minimise cost. There are solutions out there that do just this without requiring significant investment. For example, SITA Smart Path is our modular biometric ID management solution, which integrates into existing airport infrastructure and airline systems cost-effectively.

Cost efficiencies are already being achieved through improved data processing times, joining up and digitising separate travel processes, and improvements in decision making resulting from the use of this technology. Our recent deployment at Beijing Capital International (BCIA) has significantly sped up passenger processing, with the boarding of an Airbus A380 with 400 passengers taking less than 20 minutes, for example.

Biometric technology is a prudent option for airports and airlines to consider. With the increasing use and benefits of biometric technology, airlines and airports will inevitably need to get onboard soon, if they have not already.

**BTT:** Your aim is to support a seamless and contactless passenger ‘journey’ through airports. Which individual biometric technologies – like face recognition, real-time monitoring and predictive analytics – help in achieving this, and how?

Peter Sutcliffe: We aim to support the industry to deliver a seamless passenger journey even before reaching the airport, through the airport, and on arrival and beyond. Biometric capabilities will underpin the future processes here, achieving improved security, safety and efficiencies for all stakeholders. Facial biometrics will be a popular choice because it is the only mandatory biometric in an ePassport chip readily available for identity verification. There are many other schemes out there that use iris and fingerprints for various reasons, and multimodal solutions that leverage more than one biometric type.

This seamless and contactless experience is in place at BCIA, where the entire outbound passenger journey – from check-in and bag drop through to immigration, security and boarding – has been automated using facial biometrics, as well as real-time monitoring and predictive analytics.

The airport does this by using facial technology to scan and capture a passenger’s biometric details to verify their identity at the first touchpoint (typically an airport check-in kiosk) or on their mobile device. A secure digital travel ID record or token is created once the biometric details are confirmed. Passengers then have a ‘walk-through’ contactless airport experience in subsequent check-in, boarding and exit points, because biometrically-enabled gates perform real-time scans of the traveller – enabling them to pass through without the need to show or scan boarding passes or passports. Real-time monitoring (for performing real-time facial scans) and predictive analytics (analysing and verifying images and data at speed) work in combination with biometrics here.

“**Beijing Airport uses facial technology to capture a passenger’s biometrics. A secure digital travel ID is created and passengers then have a ‘walk-through’ contactless experience across subsequent check-in, boarding and exit points”**

This walk-through experience can be delivered in the arrivals process too. Facial biometric technology can enable frictionless, automated border control for a contactless journey through immigration and customs on arrival. For example, the technology can cre-
ate secure biometric tokens during passenger pre-vetting processes, such as electronic travel authorisation or dedicated pre-arrival apps for faster immigration and customs checks.

The potential for the use of biometrics, combined with real-time monitoring and predictive analytics, is extensive. It can highlight where there is risk and where there is no risk, based on travel profiles, to help border staff analyse masses of advance passenger information. The technology can help airports and airlines to visualise and understand where problems and backlogs might occur – such as bottlenecks, area capacity strains, or when individuals are going the wrong way or need assistance. Quicker solutions to these challenges can then be found.

But it is imperative to firmly follow ethical and privacy principles when considering the use of such advanced technologies alongside biometrics. As a data controller and data processor, SITA processes biometric data in accordance with our ethics charter. We observe applicable laws and regulations and our customers’ instructions when processing any biometric data. We only support the ‘legitimate use’ of biometric and biographic data. Our systems also meet relevant data privacy regulations, including GDPR. And as a Biometrics Institute member we follow its ethical best practice.

**BTT:** What in practice is involved when passengers use their mobile phone-based biometrics or biometric kiosks to pass from check-in to boarding? And what’s the advantages of this for the travellers themselves?

**Peter Sutcliffe:** Travellers queue up at several different processing points as they pass through an airport, often searching their bags or pockets to find passports or boarding cards and then waiting while their documents are verified. If one person in immigration has a problem or they’ve exceeded their baggage weight limit, the whole queue stops while that person negotiates with staff or repacks their luggage. This takes time, causing frustration for them and the other passengers that are being held up.

We know that travellers feel a lot more relaxed when they have access to self-service options because they are in control. Most people today can quickly pass through kiosks, eGates and so on with little problem. And when someone has an issue, there are airport and airline staff available to help them out. More self-service and automation combined with biometrics is a win-win for travellers and airport staff alike.

For passengers, using their mobile device and/or biometric kiosks to pass from check-in to boarding is convenient. Checking-in with a mobile phone works in a similar way to checking-in via an airport kiosk. You will either be asked to download a compatible identity app or utilise one embedded and dedicated to the airline or airport facilitation process. You can then scan the machine-readable zone on your ePassport using your camera phone to enable NFC (near field communication) technology on your phone to read the information on your passport chip.

After following selfie instructions with your camera phone, this image is compared with the one stored on your passport chip and checks are performed for face liveness (ie, that this person is live and not a spoof). Once verified, and consent is given, a travel identity token is created and stored securely on your phone and/or shared with participating providers across the journey. At the airport, subsequent kiosk checkpoint cameras recognise your face (they perform a real-time scan of your face against the image in your digital identity token) and let you pass through in a few seconds.

Covid-19 has accelerated the use of mobile for a more contactless and self-service experience, and mobile self-service is something that passengers will come to expect more and more in their journey. Around 45% of travellers are prepared to move from a paper to a digital identity according to a recent report by the World Travel & Tourism Council. Mobile-enabled biometrics that allow passengers to keep control of their identity, check-in in advance, pass through the airport, arrive at their destination and access destination services without showing any physical documents are likely to be an industry norm in the next few years.

**BTT:** SITA has said that a harmonised approach to data management between governments is crucial to avoid any further or future health emergencies damaging the air industry. What does this involve, and are governments receptive to this change?

**Peter Sutcliffe:** We believe a harmonised or consistent approach by governments to data management will support the industry through any further waves of the pandemic or other emergencies. It is both crucial and achievable. Many governments have already embraced a more consistent approach to data management resulting from past crises. For example, post-9/11, governments acted quickly to introduce measures to improve security, such as collecting advance passenger information for risk assessment purposes, and these are still rolling out today.

What is imperative is consistency in what new data is collected, when, and its accuracy.
This data, along with government intelligence, will determine a passenger’s health risk, to deny or permit entry into a country. Provision of advance traveller information alongside health data will be a condition for travel in many cases, like visa or electronic travel authorisation.

Governments will need to collect new information about a traveller’s health and their recent travel history (whether the traveller has moved from or through a Covid-19 high-risk country, for example) in addition to existing advance passenger information (API) to allow for timely risk assessment. Governments may also need to collect documented evidence of health tests and vaccinations, and again this needs to be digital to be effective.

Governments may have collected API on passenger landing cards in the past. Now they will require it digitally, so it is available in advance and can be quickly processed to allow border crossing to be authorised. Digitally enriched travel records also enable governments to contact passengers at short notice to inform them of identified health risks that affect them—for example, related to newly detected cases on a flight they may have taken.

As governments turn their attention towards assessing health risks, they will inevitably also focus on the reliability of health assertions. Collaboration among various stakeholders will be vital in creating trust that health assertions from another country, vendors from other countries, or those from the passenger themselves are accurate and genuine. Health assertion validation could work in a similar way to making a visa application. Visa approval can take some time, but because health status is somewhat volatile and needs to be provided as close to the point of travel as possible, swift validation will be critical.

Since routes between countries are complicated, governments must work with the air transport industry to establish common standards for trusting the health status of an individual, linking to assured identity (including biometrics for touchless transit) and integrated with airline systems via advance passenger processing (APP), to hold off on issuing a boarding pass, and prevent unwell passengers going to the airport in the first place.

BTT: Are there regional differences in the global take-up of biometric technology in aviation? Which countries, airports or airports are adopting the technology first, and what are the best leading adopters doing?

Peter Sutcliffe: With all the technologies now available, there is a considerable amount of industry innovation taking place. ‘Kerb-to-gate’ seamless travel processes are in place in some airports where a passenger can literally step out of their taxi and pass through all control points without presenting a boarding pass or passport. This outbound biometric technology is in place around the world, even in developing nations.

The ‘joining up’ of this outbound biometric with the transit or arrival processes is being taken up more slowly. It is happening using trusted traveller programmes in countries such as the US. Still, this is relatively uncommon, frequently not very joined up with the departure process, and often needs to be separately subscribed to by the traveller.

We have the technology to take an identity submitted in the early part of the journey—through an e-Visa/ETA application or at check-in—and bind this to airline and other journey data to be used biometrically to facilitate departure, transit or arrival processing. This can also potentially be used to give access to destination services such as picking up a hire car. Combined with assured health status from government trusted entities, this can provide a completely secure and seamless journey across all stages from pre-travel through the airport, to arrival and beyond.

BTT: Can biometric technologies help in broader ways to ensure safety from Covid-19 or future health emergencies—such as stopping passengers from high-risk countries taking flights, or tracking and tracing travellers later found to be infectious?

Peter Sutcliffe: Today’s biometric technology certainly helps ensure that people are who they say they are and that they hold authentic, untampered documents. Risks are often contained ahead of a border or ahead of people boarding a flight because of better identity assurance. Quicker data analysis technology allows faster decisions to permit or deny entry, often earlier in the process, such as when a traveller is making a booking or applying for a visa.

The biometric solutions we deploy in airports today are adaptable and future-proofed to deal with changes or disruptions like Covid-19. The potential to adapt biometric technologies to deal with changing global situations is evident. In recent months, biometric technology has helped social distancing at airports and to detect crowded areas. We can also spot passengers demonstrating unusually high temperatures through biometric thermal scanning.

Technology, including SITA technology, can identify travellers later found to be carrying the virus and other travellers sitting near the affected individuals during the flight. Though this current technology does not rely on biometrics, hypothetically biometrics could be used for tracking and tracing purposes if warranted, and if data protection and privacy regulations allow.

The application of biometrics, combined with other technologies, is already helping many airlines and airports resume their activities. It is also supporting governments to reopen their countries for business with confidence. In the future, this approach will inevitably become more commonplace with its potential for broader use and increasing benefits.

About the interviewee

Peter Sutcliffe is the strategy and portfolio director for SITA AT BORDERS. His responsibilities include the strategy and leadership of the border product portfolio, as well as market and industry engagement.

Peter joined SITA in 2011, providing innovative products to airlines, airports and governments. He has more than 20 years of experience working with government, national security and transport sectors. He holds a master’s degree in systems engineering and is based in the UK.