imprivata®

Improving Healthcare Productivity with Virtualisation and Single Sign-On

0. Executive Summary

With a large number of legacy IT systems aimed at clinicians, Denmark's Region H realised that time-consuming login processes were taking time away from the hospital's core duty: helping patients. Making it easier for clinical staff and administrative employees to access their systems became a priority.

"A number of benefits make Imprivata a more flexible, more innovative and easier handled SSO/AM solution.

Seen from a technical point of view, the benefit of the Imprivata system in ESA is that it automatically integrates physical units via a great number of drivers for e.g. card and card-readers.

Also Imprivata has a tool to configure SSO for all applications which is very easy to use and can be as simple or bespoke as current needs dictate.

Plus Imprivata Extension Objects makes it very easy to trigger actions, making Imprivata a very flexible and innovative solution."

Søren Bank, Head of the department Application Management at Region H's central IT department, CIMT (Center of IT Medico and Telephony)

From December 2009 through September 2010, Region H ran three separate pilot projects testing three different scenarios to create a solution for "Effective System Access" (ESA) - as the overarching project came to be called. The pilots were evaluated on the following factors:

- Login times
- General user experience and functionality
- Robustness and scalability
- Operations and maintenance
- Information security / Governance
- Single Sign-On (SSO)-specific user experience

Evaluation of the pilot projects yielded a clear choice: VMware virtual desktops augmented with Single Sign-On and authentication management from Imprivata. This solution was implemented in 2012 across Region H's 13 hospitals.

Throughout the ESA project, Region H and Imprivata collaborated closely, sharing project plans to maintain a clear overview of progress. This gave Region H predictability across the project timeline, minimising complexity and allowing challenges to be solved proactively.

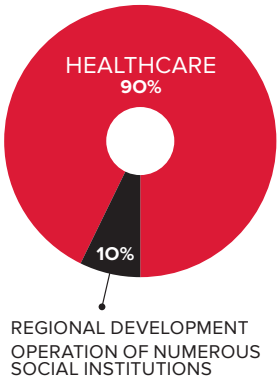
Implementing Imprivata has created clear benefits for Region H:

Time Saved: The organisation's own measurements show that doctors using ESA/Imprivata on thin client machines can save 37 minutes per day, similarly 22 minutes per day for nurses.

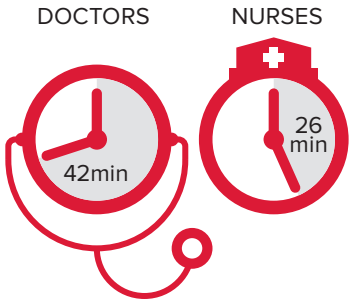
Workflow: With Imprivata removing the time and energy of logging in and remembering passwords, clinicians have reduced login times substantially. They have a simpler workflow, with virtual desktops which follow them across clinical contexts.

Data Security: Fast and easy logins support compliance with EU data security standards, improve accuracy when clinicians register patients' data and deliver better data quality as a basis for treatment and care.

DENMARK'S REGIONAL COSTS



TIME SPENT EACH DAY ON LOGIN PROCESS BEFORE IMPLEMENTING IMPRIVATA SOLUTIONS



1. Region H

Denmark is divided into five geographical regions, working as elected administrative units. These units are tasked with healthcare, regional development and the operation of numerous social institutions. Healthcare accounts for around 90% of each area's regional costs.

Region Hovedstaden (Region Capital) or just Region H has 1.75 million residents (as of July 2014) and is the largest of the five regions. Covering the capital, it has the most hospitals (eleven in all), is highly visible politically and economically, and is often the first mover in adopting new techniques and technologies.

Needs, Challenges and Opportunities

At the turn of the millennium, major changes in the Danish public sector were under way; and in January 2007 the 14 counties of Denmark were restructured into five regions in order to increase efficiency and reduce costs.

With around 130 different IT systems aimed at the needs of clinicians, Region H realised during this period that improving clinical access to IT systems could be a driver of efficiencies along with rest of the public sector.

These systems catered to around 28,000 or so users, including around 25,000 clinicians. They used a large number of specialised systems; most of which required separate logins with different passwords – and many of these had to be changed regularly. Some systems even needed different levels of credentials. Overall, care professionals were spending far too long accessing systems and data, directly taking time away from their core task: providing better patient care.

Irrespective of the frustration this caused clinicians, the cost in pure efficiency was vast: before ESA, Region H's own analysis showed that doctors spent 42 minutes and nurses 26 minutes every working day on login processes. The Effective System Access (ESA) project was implemented to find a solution to this unproductive and costly use of time.

Proving Imprivata: Pilot Projects

Region H rapidly concluded that the most effective answer to the organisation's problems was a Single Sign-On (SSO) system with integrated authentication management (AM), supported by a virtual desktop (VDI) solution. This would give users easy and fast access to systems and data from any device, anywhere, as well as a centralised solution that would be simple and cost-efficient to keep updated.

To identify the ideal solution, Region H ran three pilot projects between December 2009 and September 2010. During this period, Region H tested three different VDI and SSO/AM configurations – each running for six months and in separate hospitals: Bispebjerg, Glostrup and Frederiksberg.

"In general, clinicians are not big fans of IT, but they like the ESA solution and use it willingly. Now, Imprivata remembers the passwords automatically once each clinician has identified themselves to ESA.

When a clinician has left a computer after using relevant data and systems, the 'follow me-desktop' feature will open the same data and systems as soon as the clinician logs in again; on the same machine, on another computer or even on the clinician's computer at home."

Pia Daugbjerg,
Implementation Manager

During 2011, the pilot schemes were carefully evaluated on a range of efficiency and experience criteria:

- Login times
- General user experience and functionality
- Robustness, including scalability
- Operations and maintenance
- Information security
- Single Sign-On (SSO)-specific user experience

The evaluation process yielded a clear preferred choice: VMware's VDI solution and Imprivata for Single Sign-On and authentication management.

Implementing Imprivata

The ESA project was rolled out in 2012, led by Pia Daugbjerg, Region H's Implementation Manager and a specialist in LEAN, workflow optimization and IT (she is also a trained nurse). Furthermore, and importantly in the ESA context, she is a specialist in establishing and communicating the needs of Region H's clinicians and CIMT (the Central IT Medico Telephony, or central IT department).

Whereas SSO/AM and VDI solutions are often implemented sequentially in other parts of the world, in Nordic countries they are frequently implemented simultaneously, in order to increase adoption, as one 'big bang' change to IT systems is perceived as less disruptive than two smaller programmes.

"The task was to implement ESA, the VMware virtual desktops and the Imprivata SSO/AM solution to Region H's at the time 13 hospitals and 28,000 users", says Daugbjerg. "We managed the deployment in a cascade across nine months", she says, "supported by a supplier council formed of experts from Imprivata, our other suppliers and CIMT, who were able to solve any problems as they arose".

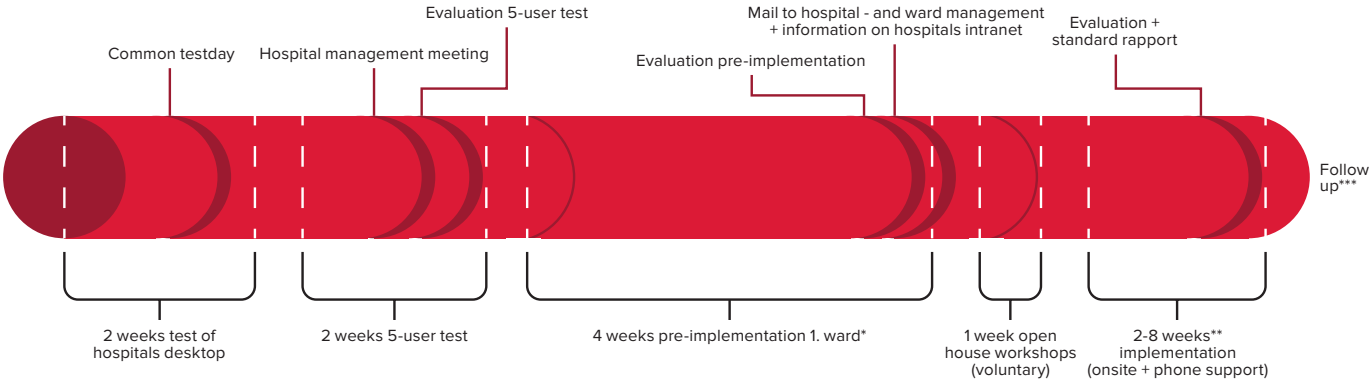
The full ESA solution spans 140 different IT systems, all of which are used by Region H's clinicians. The Imprivata SSO/AM solution system functions as a 'focal point', connecting each individual user with the applications that they use, in the most efficient way possible; allowing the entire ESA solution to work.

Clinicians access the ESA suite on three types of devices in Region H:

- 'Classic' PCs
- Teradici-based zero clients with card-readers
- Multi-user PCs (on wards)

Although Region H advises clinicians to use the ESA solution, it is not required: these systems can all still be accessed without using ESA.

GENERIC TIMELINE



* Pre-implementation = the first ward that starts using ESA. Size: approximately 200 users. Purpose: to check for errors, network problems and other possible challenges

** The length of the implementation depends on the amount of users on location. The smaller hospitals implement in 2 weeks, the biggest organisations have 4 x 2 weeks (8 weeks.)

*** Follow up: 2 months after end implementation, an independent firm evaluates our efforts and the usage rate. The outcome defines our follow-up activities.

Imprivata in Use

"In a modern hospital, IT is a prerequisite for productivity", says Daugbjerg. "So getting easy and secure access to all the various systems used by clinicians is very important".

In spite of this, clinicians are traditionally not advocates for IT in general – they are often not digital natives, and IT is only a tool in the more important pursuit of better healthcare delivery. "Having said that, clinicians like the ESA solution overall and use it willingly," Daugbjerg adds. Before ESA, it was difficult for clinicians to remember their passwords. "Now, Imprivata remembers the passwords automatically once each clinician has identified themselves to ESA. Furthermore, Imprivata has a feature to reset your own password, which makes personal account management much easier".

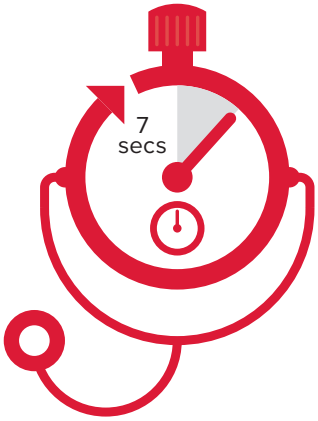
Another popular feature of Imprivata is the 'follow me-desktop'. "When a clinician has left a computer after using relevant data and systems, the 'follow me-desktop' feature will open the same data and systems as soon as the clinician logs in again; on the same machine, on another computer or even on the clinician's computer at home".

At Region H's hospitals, many of the desktops are zero clients. Logging on to these zero clients is very easy, as they are equipped with a card reader: logging in is as simple as swiping an identity card. "This feature is very popular with clinicians, as it makes it very easy and fast to access data and systems," says Daugbjerg.

In general the clinicians value ESA and the Imprivata SSO/AM solution: "The workflow is much better and faster now", notes Daugbjerg. "It takes 60-80 seconds for a clinician to log on or authenticate first thing each day. Re-logon/follow me-desktop takes just seven seconds. And as studies show that clinicians on average log on 70 times per day, the time savings are substantial".

AVERAGE NO. OF TIMES A CLINICIAN LOGS IN EACH DAY

TIME TAKEN TO RE-LOGIN AFTER FIRST LOGIN



Region H: Imprivata Now and in the Future

Søren Bank is Head of the Application Management department at Region H's central IT department, CIMT. He was instrumental in the pilot projects that led to the selection of the VMware and Imprivata solutions and now manages the daily operation of Imprivata and other systems.

He is unequivocal on the future of authentication in Region H: "Imprivata is Region H's standard for Single Sign-On and authentication, and will continue to be so in the future. So whether we talk Single Sign-On, authentication or change of passwords within the limits of ESA, Imprivata is what the region uses today, and will continue to use in years to come."

Right now, Søren is looking for funds to start another Imprivata-related project: "ESA is primarily aimed at clinicians. The service has several other employee groups though – employees who do not access systems via ESA. In the future CIMT wants to explore the possibility of giving these employees Imprivata features too; for Single Sign-On and authentication along with changing passwords."

2. Benefits

- Time Saved
- Workflow
- Patient welfare and information security

Time Saved

As part of the Region H deployment of the services making up ESA, an independent consultancy was engaged to impartially evaluate the time being lost to inefficient processes before ESA; and then the productivity gains for clinicians using ESA. The evaluation included 'shadows' who would monitor Region H clinicians during their hospital workday and measure the time taken to access information.

Across the board, the ESA project – including Imprivata - has improved the login process, making logins faster and improving the general level of satisfaction with IT among service users. Questionnaires (quantitative) and observational studies (qualitative) both confirm the efficacy of the ESA/Imprivata solution. Pia Daugbjerg notes that time is at a premium in the busy lives of healthcare professionals, and therefore saving time using Imprivata is an important benefit for Region H.

"The system has given us simpler, faster and also more flexible and secure access to clinical applications", says Daugbjerg. "Previously, clinicians had to use different passwords for each application – passwords they had to remember and change frequently. This caused frustration and simply took time out from their actual work", she says.

Externally Validated Time Savings

Login Time	Doctors	Nurses
Without ESA/Imprivata	42 minutes per day	26 minutes per day
With ESA/Imprivata	5 minutes per day	4 minutes per day
Time Saving with correct/ideal use of Imprivata solution	37 minutes per day per doctor, an 88% reduction	22 minutes per day per doctor, an 84% reduction

When this time is aggregated and converted into clinical resource, the deployment of Imprivata to a reach of 80% of clinicians amounts across a year to the equivalent of adding up to 1000 clinical professionals to the payroll. It is clearly an opportunity to deliver massively increased hours of patient care.

Workflow

Doctors and nurses working in hospitals don't spend their time tied to their offices – if they have an office at all. They work on-the-go; in examination rooms in clinics or on the wards. The average clinician will use a number of different end-points, and often many clinicians will share those end-points and devices.

The Imprivata solution means each of these transitions is not burdened with the waste of time and energy associated with a new login or remembered password, allowing IT to support the natural rhythm of each clinician's working day.

Says Daugbjerg: "The workflow is much better and faster now: it takes 60-80 seconds for a clinician to log on for the first time each day. Re-logon after a transition takes just 7 seconds. And as studies show that a clinician on average logs on 70 times each day, the time saving is substantial".

Add to that the follow me-desktop feature, and as well as logging in, clinicians get immediate access to the same data, software and context they left when logging off their previous device. This saves further time, improves workflow and maintains continuity- even from a PC at home or indeed anywhere else in the world.

- Reduced logon times directly generates more time for patient care
- Follow-me Desktop creates simpler, more natural workflow
- Together, fast logons and Follow-me Desktop support each clinician's often very mobile workday

"The situation before ESA was annoying. You had to remember all your passwords for all the different systems in order to login many times a day.

In contrast, today all clinicians use ESA, giving us a number of benefits. Most clinicians use a number of different end-points, moving around during the day. ESA and the SSO/AM solution make it easy and fast to take over a PC from a colleague. It is done within 5 seconds. Also, when you login in the morning, it allows you to carry on exactly where you left off the day before; with all the right systems and data active the moment you start.

With ESA matching our actual work processes, clinicians save time. And as time is a limiting factor, more time means a better quality of work."

Nils Jakob Knudsen,
Physician at the Section I of Endocrinology at Bispebjerg Hospital.

Patient Welfare and Data Security

Whilst it is a subsidiary benefit, quantified only anecdotally, there is ample evidence that the Imprivata solution also leads also to better patient data security and information management, which in turn generates better care.

Data security and purity are improved because where clinicians and nurses share end-points, a slow login procedure with multiple passwords for each separate system makes it tempting for colleagues to share identities. This violates both the organisation's established policies on data logging and traceability as well as EU law, both of which are critical in dispute cases e.g. malpractice.

A simpler workflow for clinicians, where IT visibly supports their care-giving rather than being perceived as an obstruction, creates less distraction and complexity for them as they work.

Similarly, fast and easy logins encourage a 'digital-first' approach to note-taking, where patient data is registered fast and early, minimising the errors associated with handwriting and resulting in more data of better quality as a basis for treatment.

Summary of Benefits:

- More time to patient care
- More accuracy and better data quality as the basis for treatment and nursing
- Accurate logging giving complete traceability and auditing

"Having ESA as a general portal for clinical applications, including Imprivata SSO, is a great help as I now have fast access to all relevant systems. Also I don't have to remember separate passwords - for me typically seven passwords - to get secure access to different clinical systems.

Before ESA, my colleagues and I had to change some passwords every three months and others every second year. This was a stress factor for me and my nursing colleagues, often resulting in small written notes with passwords. This was certainly insecure, but an easy solution to a non-productive problem. Now ESA has helped us all comply fully with security policies in a way that is also productive for clinicians.

Besides the fast and easy login, I use the follow me-desktop all the time: it makes it very easy to keep an overview of our patients' data – it has really reduced my daily workload.

In general I am very happy with ESA and the Imprivata solution. It's easier to work efficiently, which matters to us; as nurses have a vast number of facts to document every day."

Ditte Marie Hammer,
Head nurse at Orthopedic Surgery, Section M, Bispebjerg Hospital

3. Lessons Learned: Best Practice Deployment Advice

"ESA is a success", says Implementation Manager, Pia Daugbjerg. "But the process has also taught us a couple of lessons. Importantly, in order to be used widely and so to be considered a success, end-users have to understand the ESA concept. If they lack this understanding, they tend to be uncomfortable with the system and end up choosing inefficient ways of using the applications.

"This became clear as clinicians at one hospital - with a culture proactive towards IT and clinicians who are comfortable with change and evolving systems - readily understood the value of IT & ESA and therefore used it effectively. Yet at a similar hospital with just a less welcoming approach to technology, the result was dramatically less effective: clinicians chose to access applications manually, entering their usernames and passwords instead of using ESA– thus minimizing the value of ESA.

"So I recommend spending money and time when implementing ESA, on teaching clinicians the basics about VDI and SSO/AM," says Pia Daugbjerg.

From pilot through to deployment and ongoing operations, Pia Daugbjerg, Implementation Manager at Region H offers the following advice:

- **Drive communication and problem-solving with a "Supplier Council"**
  To implement a complex multi-partner solution in the most efficient way possible, Region H asked the suppliers involved (Imprivata, VMware and Dell), to collaborate in a supplier council with the region's CIMT (Central IT Medico Telephony) team. The group was collectively responsible for the solution.

"This gave Region H security that no supplier would pass blame if problems turned up. Instead, everybody had a vested interest in getting the full project up and running, making life easier for us."

- **Give IT staff full knowledge of end-users' workflow**
  Technology is not a solution to operational problems in itself. It is essential that IT solutions are created with full insight to actual clinical workflows and use-cases.

"This means that IT leaders in the organisation should have at least a basic knowledge of end-users' workflows: how does a workflow look and how can it be optimised with ESA? You have to know this in order to be able to match users with access rights to the vast number of applications."

"Projects like ESA are implemented in order to save time and money in the public sector. But sometimes stakeholders have little knowledge and even less appetite for 'yet another IT system'. So having invested in the systems themselves and the implementation process, managers and other stakeholders sometimes underestimate the importance of education and communication in reaping the full benefits of a new deployment."

Pia Daugbjerg,
Implementation Manager

- **Plan and budget for user education**
  Even for users who understand a traditional IT solution, the virtualisation concept takes some education/training to fully understand and get used to.

"When you sit in the middle of a complex technical project like ESA, it is tempting to focus on the technical or economic issues", says Daugbjerg. "But giving end-users a basic understanding of ESA and the concept of virtualisation is equally important. If they don't feel comfortable using the VDI/SSO solution, there is a high risk that they won't use it at all, or will use it inefficiently, which means that you will not achieve the anticipated value in time saved. Indeed, on the contrary, you may end up with dissatisfied and disillusioned users who actively resist the solution. To sum up: educating end-users in both the concept and the specific solution is extremely important."

- **Get stakeholder support from the top**
  Interest in major IT infrastructure projects typically comes not just from hospital management, but also from a wider range of public sector stakeholders. They demand effective communication to ensure buy-in; equally influence from these stakeholders can be leveraged to support the new deployment.

"Projects like ESA are implemented in order to save time and money in the public sector. But sometimes stakeholders have little knowledge and even less appetite for 'yet another IT system'. So having invested in the systems themselves and the implementation process, managers and other stakeholders sometimes underestimate the importance of education and communication in reaping the full benefits of a new deployment", says Daugbjerg.

"It can also be challenging to insist that busy and professional staff give priority to training, or take time out of their already busy days for IT. To move these priorities forward, you need a blend of organisational maturity and senior level support."

- **Maintain your technical infrastructure**
  In order to gain the most from a new VDI and SSO solution it is essential that the underlying technical infrastructure is current and working.

"Region H's technical infrastructure was not initially up to scratch; for example the LAN was not optimally efficient", says Daugbjerg. "This led to various challenges for the ESA/SSO/AM deployment process. So, be sure to have an optimised foundation first, in order to get the maximum benefit from a complex solution like ESA".

"Imprivata functions as an enabler for all applications within ESA – or any other solution. Using Imprivata, it is easy to configure the solution, making it simple or complex according to the needs of the organisation and its individual users."

Søren Bank, Head of the department Application Management at Region H's central IT department, CIMT (Center of IT Medico and Telephony)

4. Imprivata's Role in the ESA Project

Søren Bank is Head of the Application Management department at Region H's central IT department, CIMT (Center of IT Medico and Telephony). He was instrumental in the pilot projects that led to the selection of the VMware and Imprivata solutions and now manages the daily operation of Imprivata and other systems.

Bank puts Imprivata at the forefront of authentication technology. "Compared to other SSO/AM products, Imprivata automatically integrates with a wide range of physical units, already having plenty of drivers for e.g. cards and card readers, in particular a native integration with VMware and several end-point devices; all of which makes the implementation process much easier. This native integration means that Imprivata is already part of the end-points' core technology, installed directly on the chip of the units, they are effectively pre-installed with Imprivata. On the software side, integration with the operating system allows Imprivata to fully leverage virtualisation technology to deliver efficient clinical roaming on each desktop."

Bank also says that Imprivata's flexibility and configurable interfaces underpin the breadth of applications being deployed. "Imprivata functions as an enabler for all applications within ESA – or any other solution. Using Imprivata, it is easy to configure the solution, making it simple or complex according to the needs of the organisation and its individual users.

"Imprivata has an Extension Objects feature, making it possible to trigger relevant effects when users log into or out of the system, making it a very flexible and innovative solution."

Working with Imprivata: the Client's Perspective

Bank has comprehensive experience from a number of demanding jobs within public IT. As a manager he is focused and goal oriented, which is why he likes Imprivata as a partner. "Imprivata is as dedicated as myself when it comes to making solutions work – now and in the future. They research to make sure they know the needs of their customer. This means that they actually know the context in which the Imprivata solution is going to work, so they can offer constructive and time-saving input," he says.

Even when the sales process has ended, Imprivata invests time in sharing knowledge with customers. Says Bank, "We still have annual meetings with Imprivata as a platform for sharing knowledge, as they give us relevant news from across the global hospital market. Also they involve Region H in future technological development, actively seeking our ideas and experience."

"This involvement and dedication to Region H is the reason why I value working with Imprivata and respect them as a competent technology partner and genuine trusted advisor," Bank says.

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Søren Bank, Head of the department Application Management at Region H's central IT department, CIMT (Center of IT Medico and Telephony)

Working with Imprivata: the Provider's Perspective

"We aim to do our utmost to make the customers' project a success," says Thomas Lehmann-Nielsen, Regional Sales Director, Nordics for Imprivata. "This means that we use our healthcare experience to give a customer all the relevant information we can – both in relation to their current needs and likely future needs. Also we use our global network to link customers with each other, providing a forum for customers to share ideas.

"With many years' experience in SSO and AM, we know how components work together. So whenever we can, we give our input to create the best interface possible between Imprivata and other systems, just as we advise about the entire process - from pilot to daily operation", says Lehmann-Nielsen.

"In everything we do, we try to earn the right to be called Trusted Advisor."

ABOUT IMPRIVATA

Imprivata is a leading provider of authentication and access management solutions for the healthcare industry. Imprivata's single sign-on, authentication management and secure communications solutions enable fast, secure and more efficient access to healthcare information technology systems to address multiple security challenges and improve provider productivity for better focus on patient care.

Over 2 million care providers in more than 1,000 healthcare organisations worldwide rely on Imprivata solutions. Imprivata is the category leader in the 2012 and 2013 Best in KLAS Software & Services Report for SSO, and SSO market share leader according to HIMSS Analytics.

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Den Haag, Netherlands

imprivata®

5. Technology

Easy Single Sign-On and Strong Authentication

Imprivata Single Sign-On and Authentication Management enable care providers to spend more time on patients and less on technology. Studies show that by eliminating the need to repeatedly type usernames and passwords, Imprivata can save a minimum of 15 minutes per user per day.

With fingerprint biometric identification capabilities, Imprivata can instantly identify care professionals for desktop access or order signing without disrupting their workflow.

Imprivata's Self-Service Password Reset function makes password administration clinician-friendly, avoiding lost productivity and expensive helpdesk calls.

With support for a broad range of applications and authentication methods, Imprivata is flexible enough to support any clinical workflow.

Key Technology Differentiators

API level integration with the VMware Horizon View Connection Broker.

Allows policy decisions to be made at runtime to streamline and tailor the connection process. For example, VMware Horizon View users can be signed in to their virtual desktop while other users are signed in to the local desktop.

Policy-driven end-user workflow optimization allows for workflows to be tailored to a clinician's specific needs or for different groups of users.

Automatically secures the previous endpoint when the session roams to a different workstation or device.

By integrating at the API level, the need to produce scripts is removed. This helps reduce the burden on IT and ensures a smooth upgrade process across new versions of VMware Horizon View.

Native firmware-level integration with Teradici PC-over-IP zero client devices.

Strong authentication support for proximity card workflows, including transaction-level re-authentication and second factors.

Out of the box configuration for Imprivata workflows across all Teradici-based zero client devices from vendors including Dell Wyse, HP, and Samsung.