trust yourself.

P3KI Physical Access Control System

Ease of Mind for your Shared Space Security

Version Rev5
June 2024

1 Example scenarios

1.1 Unstable Wifi or internet outage at property

Receiving no-contact guests late at night or while out on vacation yourself? Never worry about them not being able to access your property if there's Wifi or internet connectivity issues and no one around to fix it.

P3KI PACS does not require provisioning of access codes or accounts on your smart lock system. Instead your customers present all necessary digital and cryptographic proofs regarding their stay to your P3KI PACS gateway which locally triggers your smart lock via open standard interfaces like Matter and Thread. All it takes is a smartphone.

1.2 Offline property

Enable unattended and high fluctuation, no-contact rental scenarios for remote properties or scenarios that do not allow wired or wireless network coverage of the entrance area (door, gated properties, etc).

The same properties that allow P3KI PACS to work reliably despite unstable network connectivity, allow its use in fully offline scenarios.

No need to run network cabling to remote places on your property nor sign up for satellite internet services.

P3KI PACS makes sure access to your property is possible, secure, and personally attributable.

1.3 Personalized access sharing

Commonly, systems that allow ad-hoc access sharing do not maintain personal attribution. Not so with P3KI PACS.

P3KI PACS enables attributable permissions at ease for family and group travellers. You as the landlord only have to give access permissions to your contractual partner (main rentee). They in turn can share the permission with their family or group all by themselves. Fully reliably without the need for either party being online. This enables our sharing mechanic to even work for the remotest of remote properties out of reach of cell service and without internet connectivity.

Contrary to system that use PIN codes, P3KI PACS permissions are fully personalized. This has several benefits:

- No need to remember codes, just present your smartphone
- Know who permitted whom because all permissions are clearly tied to a specific phone
- All while producing zero overhead for you, the landlord

Version Rev5, June 2024,
P3KI GmbH c/o Recurity Labs GmbH, Wrangelstr. 4, 10997 Berlin, Germany, +49 (0)711 22051252 (Stuttgart office), +49 (0)30 695399933 (Berlin office), contact@p3ki.com

2 Why is this a problem?

We've talked to hospitality service providers, smart lock vendor support, as well as took a look at online reviews for several smart lock vendors to gauge the impact of offline scenarios or unstable internet connectivity, this is what we found:

"In this case [no or unreliable internet connection] we recommend you to use a traditional key." *–Hospitality service provider*

"For some of our units we use the NUKI system. We've sadly had repeated issues of them failing, even in regions with superb internet connectivity." *–Hospitality Serviceprovider*

"If your router fails, your guests can powercycle it on their own. However, they need to have access to the appartment. From experience, this works best using a physical key." *–Hospitality Serviceprovider*

"In fact it's complicated to troubleshoot remotely. Therefore you sadly need to interact with the device directly. An alternative might be to ask a family friend, colleague or trusted person to take a look [if you're not present yourself]." *–Vendor support*

"We can offer to cancel your booking." *–Airbnb*

"I'm having repeated connectivity errors. The wifi module is apparently too weak if the distance to the router needs to be less than 5 meters." *–Amazon customer*

"NUKI Support cannot be reached on weekends" *–Amazon customer*

"We have to remove the battery pack every two days because [the lock] looses internet connectivity." *–Amazon customer*

"Today I was locked out of my flat. While Bluetooth seemed to connect, wifi didn't connect at all. The door could not be unlocked. I had to call for someone to bring a spare key." *–Amazon customer*

"I bought a Danalock for my vacation home. […] It keeps failing over and over and I cannot access it remotely to provision PIN codes for my renters." *–Amazon customer*

"There is no way you can rely on this lock to make sure you can lock/unlock your door every time you have to. As a security product, this is a major failure. I am standing in front of the door, inside or outside, and the lock is not responsive at least 50% of the time." *–Amazon customer*

"The hub refuses to connect to the internet, even when placed directly next to a 2.4 GHz wifi router." *–Amazon customer*

Version Rev5, June 2024,
P3KI GmbH c/o Recurity Labs GmbH, Wrangelstr. 4, 10997 Berlin, Germany, +49 (0)711 22051252 (Stuttgart office), +49 (0)30 695399933 (Berlin office), contact@p3ki.com

3 What is P3KI PACS

P3KI PACS (Physical Access Control System) is a novel approach to securing access to rental properties that see a high fluctuation of tenants.

This includes but is not limited to rental scenarios like Airbnb, Vrbo, Onefinestay, 9flats, as well as concepts like couchsurfing or shared living spaces (flat shares) and shared working environments (co-working).

P3KI PACS enables personal attributable access control and access delegation for properties that are either not or not reliably online connected or otherwise do not allow classic central management and provisioning via online platforms.

4 Key benefits

- *Ease your mind*
  Works reliably if internet or Wifi gets interrupted
- *Expand markets*
  Works for properties entirely without internet connectivity
- *Security user experience*
  Personalized access without passwords and PIN codes using a smartphone
- *Ensured accountability and flexibility*
  Easy access sharing without losing personal attribution
- *Easy drop-in*
  Integrates seamlessly with existing access control solutions supporting Matter and Thread standards

Version Rev5, June 2024,
P3KI GmbH c/o Recurity Labs GmbH, Wrangelstr. 4, 10997 Berlin, Germany, +49 (0)711 22051252 (Stuttgart office), +49 (0)30 695399933 (Berlin office), contact@p3ki.com

5 How P3KI PACS it works

5.1 Online/offline hybrid permission delegation

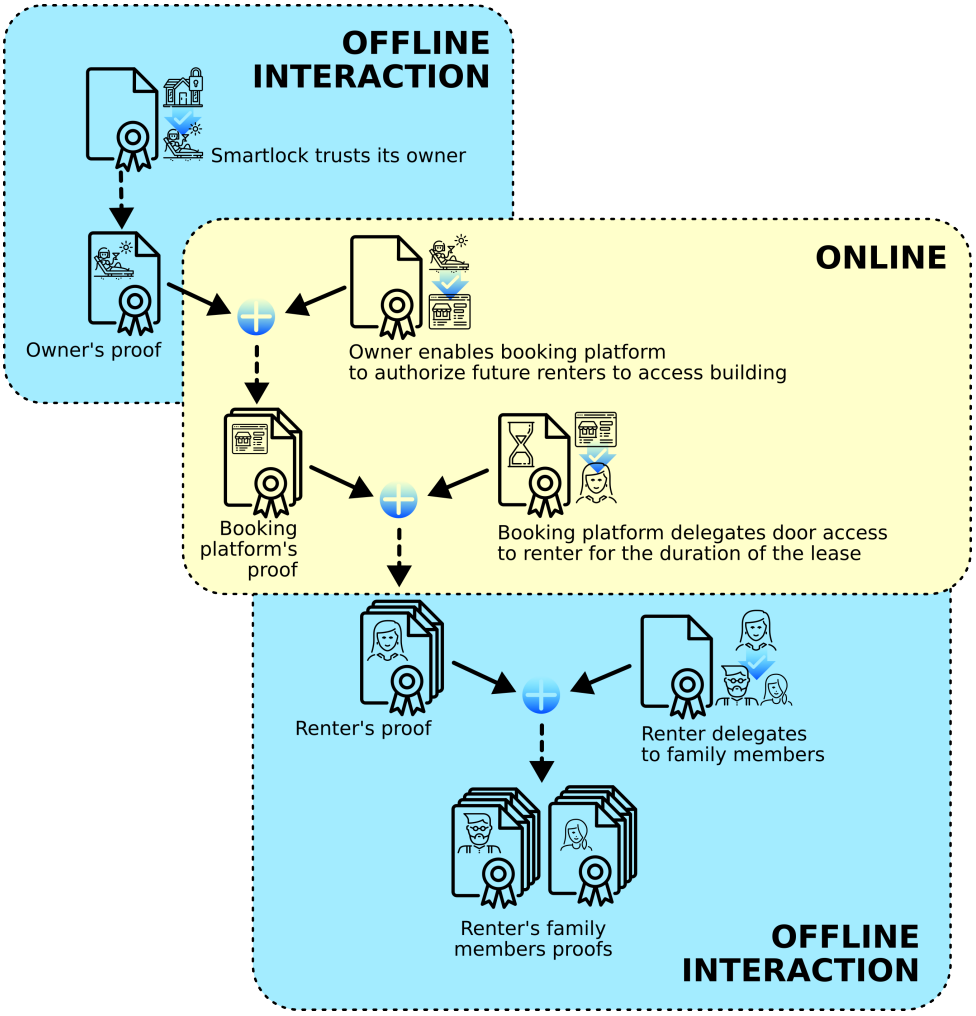

Figure 1: Hybrid environment permission delegation workflow

What distinguishes P3KI PACS from other secure access solutions, is its ability to allow key processes like device on-boarding, permission management, and verifying permissions to grant access to be handled securely while fully offline.

Shown in figure 1 above, the act of teaching a smartlock system to trust its owner, is a offline operation between the smartlock system and the owner's smartphone. The smartlock system's statement of "I trust my owner" becomes the owner's proof, which they can use in turn to control the lock.

This proof, in combination with the owner's statement of "I trust the booking platform" becomes the booking platform's proof. This in turn will be used by the platform (with active involvement by either the owner or their smartlock system), to give temporary permissions to customers who rented the owner's property. Steps

Version Rev5, June 2024,
P3KI GmbH c/o Recurity Labs GmbH, Wrangelstr. 4, 10997 Berlin, Germany, +49 (0)711 22051252 (Stuttgart office), +49 (0)30 695399933 (Berlin office), contact@p3ki.com

involving the platform are the only ones that need to be online, since the platform is a online service.

A renter receives their temporary access permission as well as the platform's and owner's proofs. This forms a unbroken chain of "permission slips". At this point, the renter will be technically able to open the smartlock. This works fully reliably, even while both the smartlock as well as renter are offline, only able to talk to each other. The renter presents a fully cryptographically verifiable proof to the smartlock which in turn it can verify offline.

Furthermore, the renter is now able to give personalized permissions to their spouse and child or any other member of the travel group. This works via any means like email, instant message sharing, or even phone-to-phone via Bluetooth and NFC without any need for online connectivity. Contrary to existing systems based on PIN codes, these permissions are tied to an individual in a way that allows any interaction with the smartlock to be attributed to an individual.

If desired, permissions can also be granted in a way that does not allow further sharing.

This offline functionality enables P3KI PACS smartlocks to be used to secure all properties, even those that have unreliable internet connectivity or no connectivity at all.

5.2 Secure offline permission proof

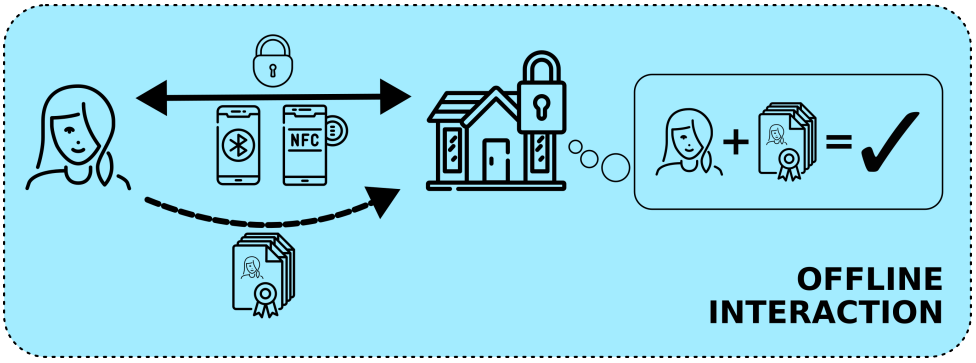

Figure 2: Outline of a fully offline permission verification

Accessing a P3KI PACS enabled smartlock system will work whether or not either party (lock or renter) is online.

First a secure communication channel is established between the P3KI PACS system at the property and the renter's smartphone using either NFC (Near-field communication) or BLE (Bluetooth Low Energy). The renter is then able to present a collection of proofs as well as cyptographically prove to the P3KI PACS smartlock their identity.

The P3KI PACS smartlock is able to verify both proof and identity while fully offline. It then keeps a detailed audit log of the interaction, complete with the entire proof presented by the renter. If the verification was successful, the door is unlocked.

Version Rev5, June 2024,
P3KI GmbH c/o Recurity Labs GmbH, Wrangelstr. 4, 10997 Berlin, Germany, +49 (0)711 22051252 (Stuttgart office), +49 (0)30 695399933 (Berlin office), contact@p3ki.com

6 P3KI Core technology

P3KI PACS is based on P3KI Core, a web-of-trust permission delegation framework designed to work under the harshest network environment conditions up to and including fully offline scenarios.

It's primary use is peer-to-peer permission management and delegation, enabling access sharing while maintaining personal attribution. This sets P3KI apart from other access sharing solutions which work by sharing tokens, keys, or PIN codes; neither of which can be reliably attributed to a person whereas P3KI Core ensures a full audit trail.

Another key feature of P3KI Core's design is it frees you from the need to manage accounts on services and devices secured by P3KI Core. Instead permissions are granted based on ad-hoc, multi-party proofs using a precise and mathematically proven policy language. This enables highly flexible use-cases involving offline services and devices which cannot be centrally managed.

7 P3KI PACS is there to make your life easier!

P3KI PACS is available as a whitelabel solution for vendors or retrofit solution for smart locks supporting the Matter standard.

Want to learn more about how P3KI PACS can address your specific access control challenges? Give us a call at +49 711 2205 1252 or send an email to contact@p3ki.com.

Version Rev5, June 2024,
P3KI GmbH c/o Recurity Labs GmbH, Wrangelstr. 4, 10997 Berlin, Germany, +49 (0)711 22051252 (Stuttgart office), +49 (0)30 695399933 (Berlin office), contact@p3ki.com