Gallagher Command Centre

Mobile Connect Cloud and App - Security

Technical Information Paper

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Important: If you received this document along with your Command Centre installation media, or via another similar channel then it may be out of date with respect to the functionality/behaviour of the cloud, and of the Mobile Connect Apps, which are distributed through platform App Stores and may be more recent than your Command Centre installation.

It is recommended you refer to the latest revision of this document, which can be found here:
https://gallaghersecurity.github.io/r/mobileconnect-cloud-and-app-security

Contents

1 Background

The Gallagher Mobile Connect app for iOS and Android lets people use their mobile devices instead of, or in addition to a traditional MIFARE or similar access card.

The app has several significant features

- Opening Gallagher Doors or performing Bluetooth Actions such as arming an Alarm Zone.
  The app uses Bluetooth® Low Energy (or NFC (Near Field Communications) on supported Android Devices) to communicate with Gallagher T-Series readers to accomplish this.
- Receiving broadcast notification messages via in-app Push Notifications
  Notifications are delivered via the cloud
- Opening BLE-capable Salto Doors
- Displaying Digital ID cards

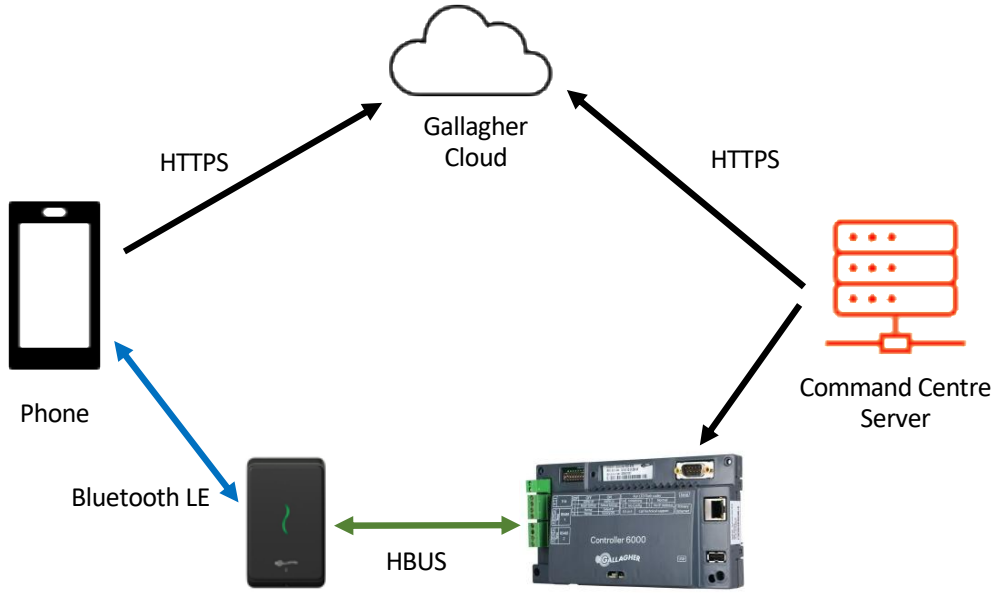
1.1 Target Audience for the Mobile Connect App

The target end user for the Mobile Connect application is anyone who might have an Access Card, including "partially-trusted" individuals such as students, contract employees, etc.

Phones are likely to be a mix of corporate and personally owned devices. Personal devices will probably not be monitored or controlled, and are unlikely to have access to corporate WiFi, VPN's or other secure networks.

2 Mobile Credentials

2.1 Mobile Access Overview



In order for secure access attempts to be made via Bluetooth or NFC, the Controller first needs to know how to identify the phone.

This means we need to get some information from the phone, back to the Command Centre Server, and then down to the Controller. This is why we need the credential Registration process.

Mobile Connect registration is carried out by sending credential data through the Gallagher Cloud.

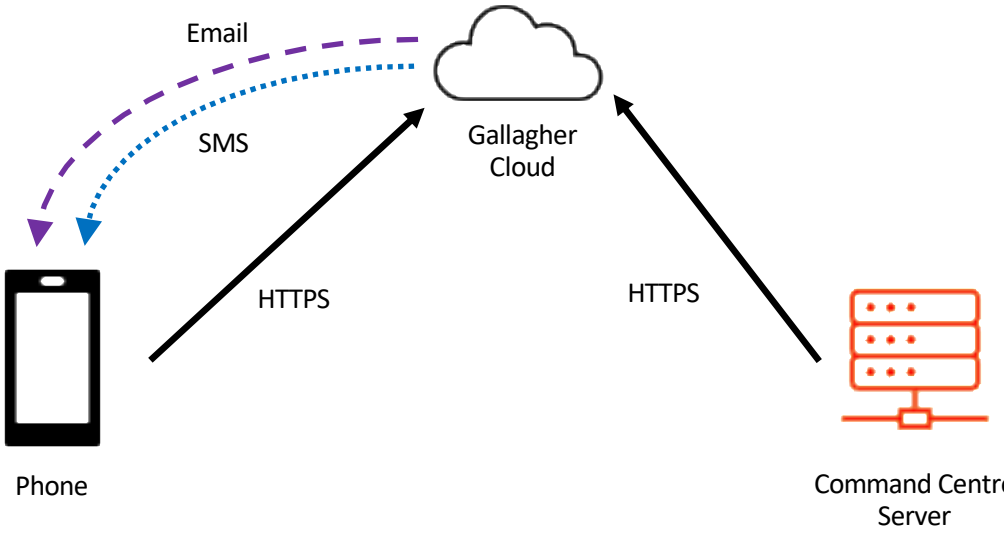
Why use the cloud for Mobile Credential Registration?

The Gallagher cloud can act as a secure relay between phones and the Command Centre server. If we did not relay via the cloud, then registration would require phones to connect directly to the Command Centre itself. A key consideration is that users of Mobile Connect are unlikely to be carrying secure, authorized company devices on secure networks – instead they are members of the general public using their personal phones on the general internet.

It would not be responsible to require customers to expose Command Centre servers to network traffic from such a wide variety of potentially malicious sources. As such, most IT departments are not willing to allow this kind of network traffic through company firewalls.

Using the cloud as a relay for this information enables your Command Centre server to remain secure and protected on your internal network.

2.2 Mobile Credential Registration Process



1. A Command Centre operator adds a Mobile Credential to a Cardholder.
2. The Command Centre server connects to the cloud registration server and sends through the minimum information needed to complete the registration.
3. The cloud sends an Email to the cardholder which contains a unique one-time-use registration code.
4. The user responds to the email, launching the Mobile Connect app. The app connects to the cloud and acknowledges the registration code.
5. The cloud sends an SMS (Short Message Service) message to the cardholder which contains a one-time-use 6-digit confirmation code.
6. The user inputs this 6 digit code into the Mobile Connect app. The app connects to the cloud and acknowledges the confirmation code.
7. The app on the phone proceeds with registering the FIDO credential, and sends the credential information to the cloud when complete.
8. The Command Centre server fetches this complete FIDO credential from the cloud, after which point it can make it available to controllers and it can be used for access.

2.3 Mobile Credential Registration Technical Details

Registration emails by default use a standard template; It is possible to customize this template, but this must be configured outside of your Command Centre software. For more information please contact your Gallagher representative.

Registration emails are sent with a from address of: **no-reply@security.gallagher.cloud**.
This is not configurable.

If you employ a spam filter, you may need to configure it to allow messages from this address.
Spam filters may also validate against the **smtp.mailfrom** header either in place of or in addition to the **from** header. Registration emails will have an smtp.mailfrom value of **<random id>@mailsender.security.gallagher.cloud**, so you may need to allow ***@mailsender.security.gallagher.cloud**.
E.g. smtp.mailfrom=01000171e6fd47ea-2cd6a766-3cf2-47dd-b207-189f0d368bf0-000000@mailsender.security.gallagher.cloud

Data sent from Command Centre to the Gallagher Cloud Services during registration consists of:

- The registration code (to uniquely identify the registration)
- The cardholder's email address (to send them the registration email message)
- The cardholder's mobile phone number (to send them the SMS confirmation code)
- Policy information such as how long the registration code should be valid before expiring

The registration code consists of cryptographically strong random data.

It expires after 7 days (by default) if not used. This expiry period is configurable individually for each site.

An SMS confirmation code expires 1 hour after being issued.

If a user enters the SMS confirmation code incorrectly more than 5 times, the invitation will be cancelled.

If the SMS confirmation code is not correctly entered within the hour, it will be reset and a second, then third confirmation code will be sent if the user re-tries the registration process.

If the user attempts to retry after the third SMS message has been sent-but-not-completed, the invitation will be cancelled.

Note: Technical details related to the cloud are subject to change. It is recommend you refer to the latest revision of this document, which can be found here: https://gallaghersecurity.github.io/r/mobileconnect-cloud-and-app-security

2.4 Mobile Credential Invalidation Scenarios

There are several scenarios where a user can invalidate their credential by changing settings on their device. This only affects access where two-factor authentication is required by the reader.

- Android Mobile Connect: when a user is enrolled using a fingerprint for two-factor authentication and an additional fingerprint is added to the device.
- iOS Mobile Connect: when a user removes their device passcode off after enrollment.

Both these scenarios require re-enrollment of the Mobile Credential.

There are also two rare scenarios in iOS Mobile Connect on Face ID capable phones, where credentials can be invalidated by revoking permission to use Face ID.

- When a user selects Face ID as their authentication method, then denies permission to the app when prompted during enrollment.
- When a user enrolls with Face ID, then disables permission to the app in the phone's settings.

When a credential is broken in this way, the app must be reinstalled before a new credential can be enrolled.

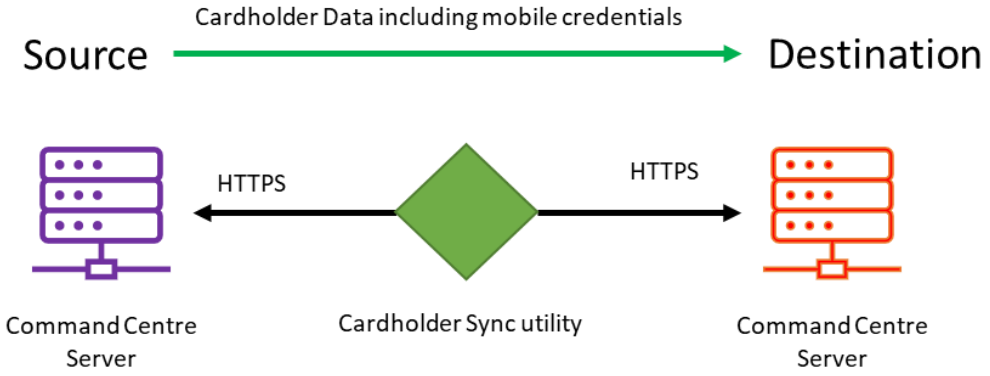
2.5 Mobile Credential Sharing

If multiple Command Centre servers are joined together using Command Centre's multi-server feature, then credentials added by one server will automatically be synchronized across all other servers in the group. This has been the case since the initial release of Mobile Credentials with Command Centre version 7.60.

Command Centre version 8.50 adds the ability to export and import Mobile Credentials between Command Centre servers without requiring the servers to be joined in a multi-server group.

To enable this, cardholders must be using the Mobile Connect app (or hosting Mobile Connect SDK inside their own app) of version **15** or greater. The systems must be configured as follows:

1. Use the Cardholder Sync utility to synchronize cardholder data between the two servers.



The cardholder sync utility will connect to both servers using their respective REST API's, will read data from the source server, and import it into the destination server.

Once this has been configured, the destination server will contain a copy of all the Mobile Credential data including FIDO public keys. These will be distributed to Controllers attached to the destination server to enable Access on their respective Readers.

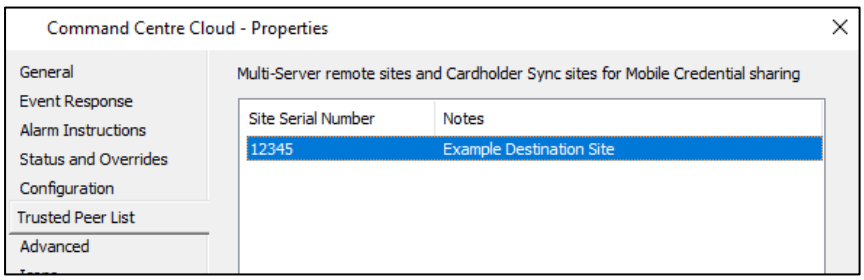
Licensing Note: Credential licensing is allocated against the server which originally issues the Mobile Credential (the "source"). Credentials imported into a destination server do not count towards the Mobile Credential license allocation for that server.

Important: Using the sync tool to copy mobile credential data in versions prior to Command Centre 8.50 is not supported. It may result in duplicate credentials - rather than sharing of the existing credential – and may cause unexpected outcomes such as access errors and consume excess licenses.

2. Configure cloud trust between the Source and Destination servers

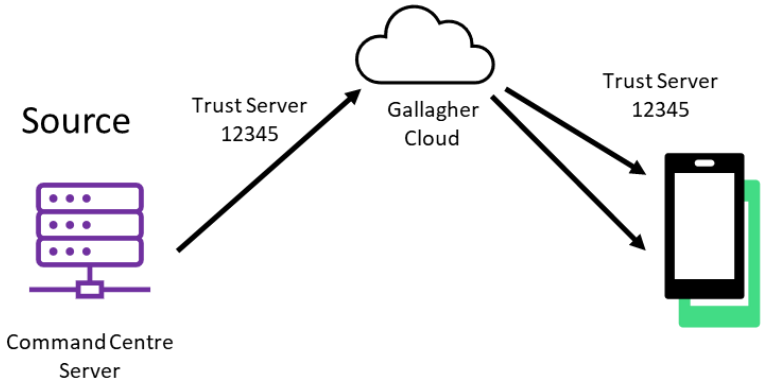
While the cardholder sync utility will copy the raw credential data, the Gallagher Cloud, as well as connected Mobile Apps / SDK's will not trust the destination server, and thus the credentials will not work on the destination, unless explicitly configured to do so.

On the source server, modify the Cloud Item's Trusted Peer List, and add the license serial number of the destination server



Upon doing this, a message will be sent from the source Command Centre server, telling it that the destination server is now trusted by the source. This allows the destination server to send broadcast notifications, SALTO keys and Digital ID cards to credentials that were issued by the source.

The cloud will then also send a message to each phone with a mobile credential issued by the source, instructing that phone to trust the destination site's readers.



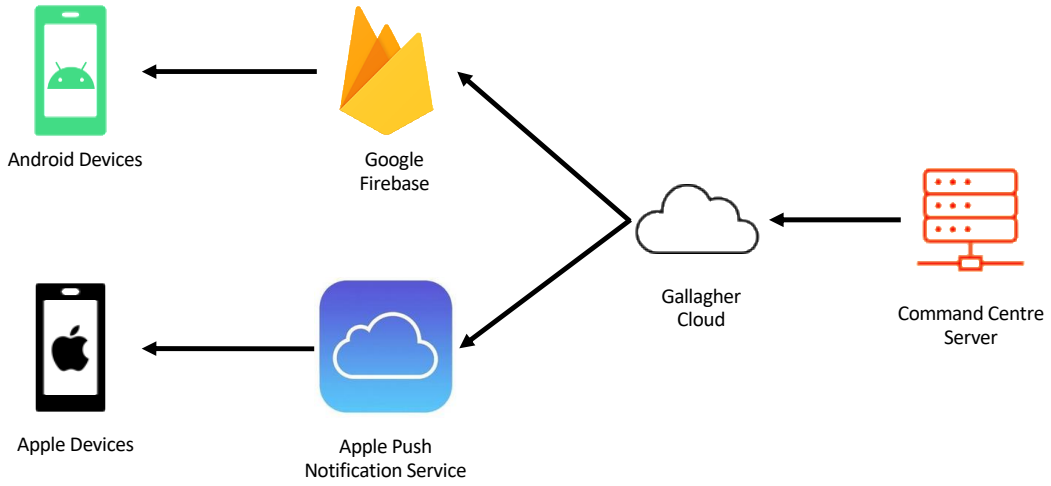
Revoking Trust

The site which initially issues the credential is considered to "own" it and has authority over which other sites are allowed to use it. To revoke trust from a destination site, remove the destination site's entry from the Trusted Peer List. This results in a message being sent to the Cloud and Phones, telling them to de-trust the given server.

Mobile Credential data exported by the sync tool will not be deleted/updated or modified as part of a de-trust operation, as an automated process may not have enough information to do this safely. The destination server will need to manually clean these up.

The public-key nature of FIDO ensures that even if credentials should remain on the destination server after a de-trust operation, there is no security risk to the source server, it is merely wasteful.

3 Broadcast Push Notifications



Android and iOS require that broadcast push notifications are sent via the respective cloud platforms controlled by Google and Apple.

Why send broadcast messages via the Gallagher Cloud?

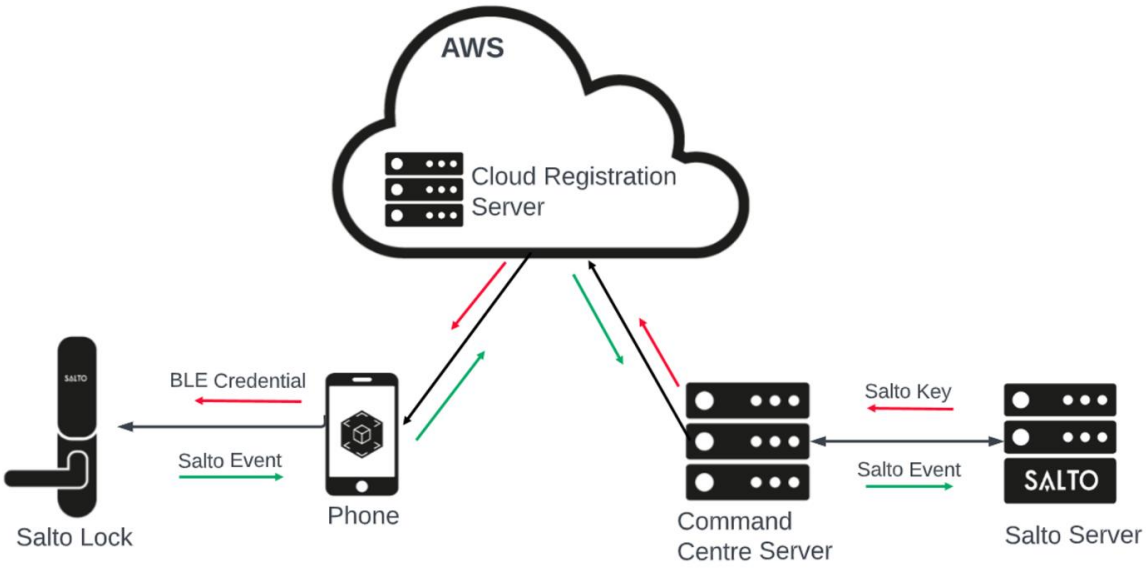
Command Centre servers could communicate directly with Google and Apple, but in practice this would have major drawbacks

- Google/Apple push notification services require security keys and a development account for their respective platforms. It would be a significant burden to require each individual Command Centre customer to create and manage these things
- Google/Apple cloud services have a huge range of dynamic IP addresses, which makes controlling outbound access through corporate firewalls very difficult.
- Mobile push notifications are not guaranteed to be reliable. If (for example) multiple messages are sent while a phone is powered off, Google/Apple reserve the right to drop some messages and only send the most recent one. By sending messages through the Gallagher cloud, we can ensure that no data is lost as our cloud can buffer messages.

3.1 Broadcast Notification Process

1. Command Centre sends broadcast notifications to the target cardholders
2. Command Centre queues these messages internally, and delivers them to the Gallagher Cloud as quickly as it can (determined by network speed)
3. The Gallagher Cloud forwards the messages to either Google Firebase (for Android devices), or Apple (for iOS devices).
4. The user receives a notification on their phone containing a summary of the message
5. When the user opens the notification, they will be taken to the Notification List screen in mobile connect.
6. Mobile Connect will use the user's FIDO credential to securely authenticate to the Gallagher Cloud, and then download the full message details, along with any other messages that may have been delivered but that Google/Apple have dropped.
   Dropped messages are rare, and generally only occur if the user has had their device powered off for a long period of time or has disabled notifications using their system settings.

4 SALTO Mobile Access integration



If your site has SALTO Bluetooth-capable wired or wireless locks, and you have integrated your SALTO server with Command Centre, then you can use the Gallagher Mobile Connect App to open Bluetooth-capable SALTO doors. This requires Command Centre version 8.10 or newer.

In order to communicate with SALTO hardware, the Gallagher Mobile Connect App incorporates SALTO's JustIN Mobile SDK. The JustIN Mobile SDK handles Bluetooth communication with SALTO locks, but it does not account for delivery and maintenance of SALTO access keys used to open those locks.

Mobile Connect solves this by attaching the SALTO key to Gallagher's existing Mobile Credential. We use the Mobile Credential to securely deliver the SALTO key to the correct phone. As such, Gallagher Mobile Credentials are a pre-requisite for using SALTO BLE locks with the Mobile Connect app.

As of Command Centre version 9.00, audit trails will also be sent back from Mobile Connect users if the site has mobile events enabled. This means that offline doors will receive access events from users with a mobile credential as well as standard card types. There is no additional setup required for this if cardholders already have mobile credentials. The additional configuration will be sent along with the next Salto key update.

If you do not have any SALTO integration, this part of Command Centre and the Mobile Connect App is deactivated

Licensing Note: While no additional license is required by Command Centre, SALTO may require an additional Salto BLE (Bluetooth Low Energy) site license in addition to the purchase of Salto BLE hardware.

Security Note: SALTO keys are less secure than FIDO-based Gallagher Mobile Credentials.
It is also not possible to use SALTO locks in PINs or Two-factor mode.
It is recommended that you use Mobile/FIDO credentials for security-sensitive areas.

4.1 SALTO key issuing and delivery

When your SALTO access changes, the following occurs:

1. Command Centre asks the SALTO server to encode a new key, containing your new access
2. Command Centre associates the new key with your mobile credential, and sends it to Gallagher Cloud Services
3. Gallagher Cloud Services store the key until the Mobile Connect app on your phone connects and retrieves the new key
   Note: See "SALTO key encryption" below for more information on key storage.
   Note: If the key is not retrieved within 7 days, it will be deleted from the cloud.
4. Gallagher Cloud Services will send a "background" push notification to your phone.
5. When your phone receives this push notification, the Mobile Connect app launches invisibly in the background. It will retrieve the new SALTO key from the cloud, and store it locally on your phone, attached to your Mobile Credential.
6. Google and Apple do not guarantee instant or reliable delivery of "background" notifications; so, whenever the Mobile Connect app is opened, it will also connect to the cloud and check for SALTO key changes in case a new key is available and a notification was not received for it.

   Note: While background notifications are not guaranteed, in practice we find that in almost all cases the background notification is delivered, and the phone receives the new key within 5-10 seconds after the cloud sends the push notification.

4.2 SALTO key encryption

In transit/cloud:

For Command Centre server version 8.40 or later, SALTO keys will be protected using End-to-End encryption, where the end user device is running version 14 or higher of the Gallagher Mobile Connect app or Mobile Connect SDK.

For more information on End-to-End encryption, please refer to the Technical Information Paper:
https://gallaghersecurity.github.io/r/mobileconnect-end-to-end-encryption

Older versions of the Command Centre server or Mobile Apps do not support End-to-End encryption. For compatibility, SALTO keys will be transmitted without it.
In this case, the keys are always transferred securely over encrypted TLS connections, and are encrypted using AES-256 when they are held temporarily in the cloud's database.

At rest on the mobile device:

Mobile Connect app versions 14 or higher will use AES-256 to encrypt SALTO keys at rest on mobile devices. Keys will always be encrypted regardless of whether the Command Centre server is running version 8.40 or an earlier version.

Mobile Connect app versions lower than 14 will not encrypt SALTO keys at rest on mobile devices.

4.3 SALTO key refresh

SALTO keys (as issued by your SALTO server) are valid for up to 7 days, at which point your key must be refreshed. This is a behavior of SALTO's system and is not under the control of Gallagher.

If you are familiar with SALTO's traditional access-card based system, this is analogous to the situation where you must badge on a wired update point periodically to refresh your card.

Command Centre and Mobile Connect transparently manages this refresh process for you. Six days (possibly earlier, see below) after issuing a SALTO key, Command Centre will ask the SALTO server for a refreshed key, and silently send this through the cloud and to the target mobile phone(s)

If, for some reason the refreshed key cannot be delivered to the phone (for example if the phone has no internet connection) then, after the key has expired, the Mobile Connect App will show a warning in the user interface and ask you to connect your phone to the internet to receive a refreshed key.

4.4 SALTO key revocation

If you make a change in Command Centre to remove SALTO access from a cardholder (for example you remove all their SALTO access groups), Command Centre will send a message via the cloud to the target phone(s) to instruct them to immediately delete their SALTO keys.

4.5 SALTO encoding performance management

If you make a large number of SALTO access changes at once - for example, you assign 5,000 cardholders to a SALTO access group that they did not previously have - this will cause Command Centre to immediately ask the SALTO server for 5,000 new keys so that they can be sent to the cloud and delivered to phones.

This may cause the SALTO server to be busy while it encodes all these new keys. Command Centre does not attempt to delay or spread this load *when you make an access change* as the priority is making sure the cardholders have their correct access as soon as possible

SALTO key refresh happens in the background and thus may not be anticipated. To reduce the performance impact on the SALTO server, when Command Centre refreshing keys, it will deliberately spread out the process, such that the key refreshes for those 5,000 cardholders do not all occur at the same time.

To spread the load, Command Centre will refresh some credentials earlier than strictly required. It spreads them out across the entire 6-day period so some credentials may get refreshed after 1 or 2 days. Because the refresh process is transparent to the user this should not affect access or performance for any individual user. Command Centre will never delay the refresh of a credential past the 6-day point as that could affect the user's access.

4.6 SALTO mobile events

As of Command Centre version 9.00, the audit trail event is the only supported event on the SALTO JustIN Mobile SDK.

Mobile events from SALTO will be delivered to Command Centre server via the existing cloud connection that is used to transport SALTO keys. These events will surface in the same way as standard card badging events.

When SALTO events are generated, they are encrypted with the appropriate site key (End-to-End encrypted) and buffered for sending to the Command Centre Cloud. When a cloud connection can be established, stored events are sent in batches. The cloud will buffer these encrypted events. The Command Centre server periodically checks its connected cloud for updates. If there are stored events, they will be sent to the server in one of these updates.

Once received by Command Centre server, decryption is possible, and the SALTO event is sent off to the SALTO server for processing.

5 Digital ID

Command Centre version 8.40 adds the ability to send Digital ID cards to Mobile Connect app and SDK users.

Digital ID cards are created on the Command Centre server, encrypted using End-to-End encryption, and then sent to the Gallagher Cloud in a similar fashion to SALTO keys.
The Mobile Credential provides a secure connection between the phone and cloud which is used to deliver the ID data, and as such, a Mobile Credential is a pre-requisite for Digital ID.

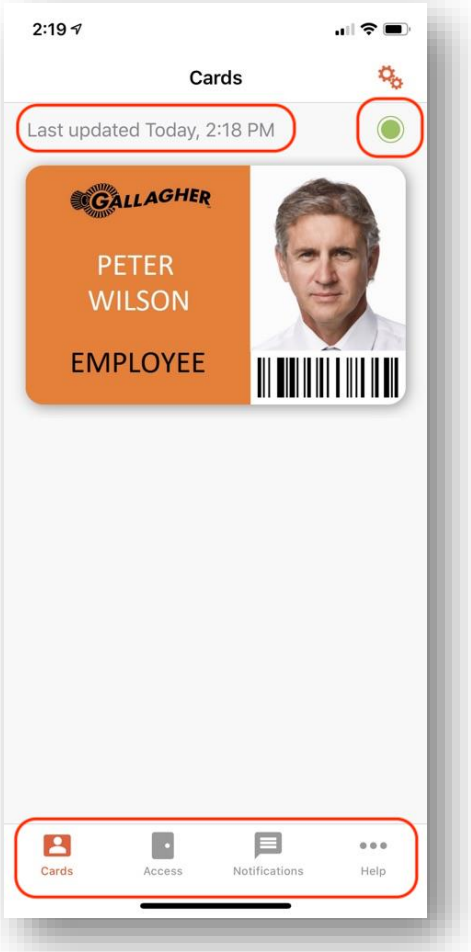
5.1 Digital ID security and verification

A Digital ID card is meant to provide a customer-branded visual identification for the cardholder.

Practically, a Digital ID consists of images and text, and it is not possible to stop an attacker from either copying the ID with a screenshot or fabricating their own images.

The Mobile Connect app adds several "liveness indicators" around the context of the Digital ID in order to stop a would-be attacker from showing a static screenshot when a security guard asks to inspect their Digital ID:

Note: This information is current as of October 2021, version 15.4 of the Mobile Connect app. Future versions may change or replace these indicators.



1. The app shows a "Last updated" time showing the last time the app synchronized data with the cloud. The app should synchronize every time it is opened, so a guard can verify that this time is relatively current.
   The time is important because if a Digital ID card is revoked, this will propagate down to the phone, which will show "Revoked" over the ID card. A user can stop this propagation by preventing the Mobile Connect app from using cellular data, and thus it won't be able to synchronize. If a guard sees a last updated time that is far in the past, it is an indicator that something may need further investigation.
2. The app displays a pulsing animated circle. A guard can verify that this is animating correctly and thus the app is not a static screenshot
3. The rest of the app is functional, and a guard can request that the cardholder taps around through other parts, demonstrating that they are not showing a low-fidelity mockup.

Due to the nature of Digital ID images, it is not possible to stop a skilled and motivated attacker from building a fully functioning fake version of the entire Mobile Connect app.

Sites should consider their security threat model; If a higher level of authentication is required, they should provision their security staff with the separate Gallagher Command Centre Mobile app so they can securely verify cardholder credentials when needed.

The Command Centre Mobile app has a Mobile Reader function, which can use Bluetooth Low Energy to communicate with the Mobile Connect app on the cardholder's phone and perform a secure FIDO authentication operation. This will establish with a very high level of security that the cardholder's credential is legitimate and that the Mobile Connect app is genuine.

5.2 Digital ID Issuing and Delivery

When a Digital ID card is added to a cardholder, or updated:

1. The Command Centre server rebuilds the Digital ID card image.
2. Command Centre associates the updated data with your mobile credential, and sends it to Gallagher Cloud Services
3. Gallagher Cloud Services store the ID until the Mobile Connect app on your phone connects and retrieves the new key.
   Note: See "Digital ID encryption" below for more information.
4. Gallagher Cloud Services will send a "background" push notification to your phone.
5. When your phone receives this push notification, the Mobile Connect app launches invisibly in the background. It will retrieve the Digital ID update from the cloud, and store it locally on your phone, attached to your Mobile Credential.
   Note: The ID is deleted from the cloud after it is retrieved.
6. Google and Apple do not guarantee instant or reliable delivery of "background" notifications; so, whenever the Mobile Connect app is opened, it will also connect to the cloud and check for updates.

5.3 Digital ID Expiry and Revocation

Digital ID cards share the same infrastructure within Command Centre as other cards. As such, they can be marked as Active, Expired, Pending, or Disabled. This can be set individually per Digital ID (for example a user can have two Digital ID cards, one Active and one Expired).

Mobile Connect will draw a gray overlay over any non-active Digital ID cards, and overlay appropriate text, such as "Expired", such that it will be immediately clear if a card is not active.

Changes are updated live on devices. In most cases, if you manually mark a Digital ID as expired, this will be visible on the end-user's phone within a few seconds or less.

Notes regarding performance of updates:

- If the Command Centre server does not have an active internet connection, or if the connection is slow, then it will not be able to send Digital ID updates, or updates may be delayed.
- If the end user's phone does not have an active internet connection, or the connection is slow, then it will not be able to receive Digital ID updates, or updates may be delayed.
- If a large number of Digital ID updates are generated at once (for example, changing a card layout that is used across many cards), then it may take some time for the server to re-generate all the ID images and send them to the cloud.

5.4 Digital ID encryption

In transit/cloud:

Digital ID data is protected using End-to-End encryption.

For more information on End-to-End encryption, please refer to the Technical Information Paper: https://gallaghersecurity.github.io/r/mobileconnect-end-to-end-encryption

The Digital ID feature was added with Command Centre server 8.40 and version 14 of the Mobile Connect app and SDK, which support End-to-End encryption. Unlike SALTO keys, there are no backward compatibility concerns, so Digital ID data is **always** sent using End-to-End encryption.

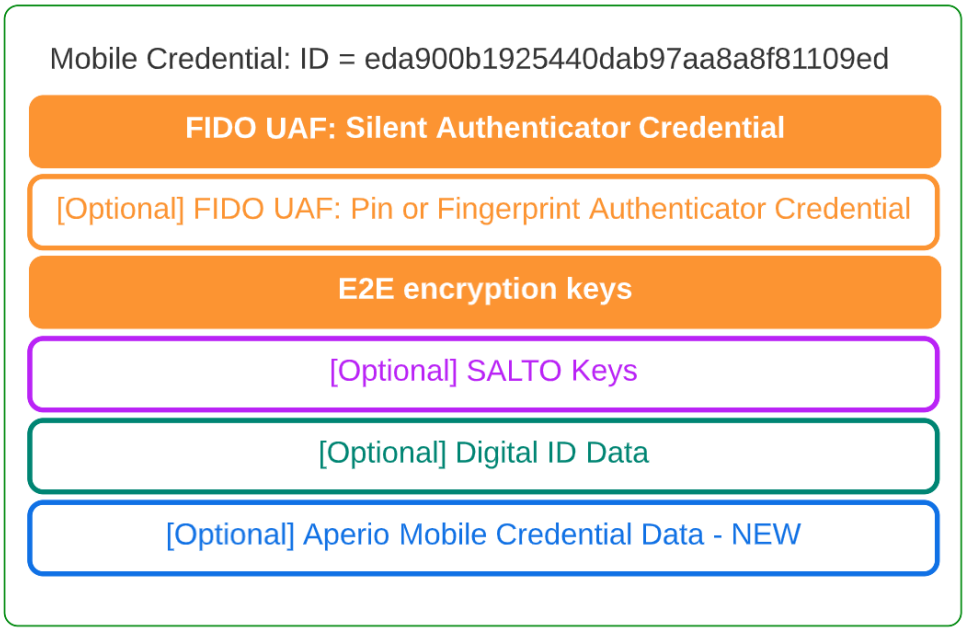
At rest on the mobile device:

Digital ID data/images are not encrypted at rest on the mobile device. They are stored in the filesystem on Android, and in the app's private database on iOS.

While this may appear problematic at first glance, practically a Digital ID consists of images and text; Anyone in a position to extract this low-level data from the device's filesystem is already able to simply copy the ID data using a screenshot or could rebuild it themselves using an image manipulation program. At-rest encryption of ID images on the device itself would not provide any meaningful security improvement.

6 Aperio BLE

Command Centre version 9.00 adds the Aperio BLE functionality to Mobile Connect. This requires BLE capable Aperio readers upgraded with compatible firmware and the Aperio PAP tool to load in Gallagher Mobile Credentials.



The Aperio portion of a mobile credential is referred to specifically as the Aperio key as it allows access to an Aperio door when carried by the user. For secure delivery, it is attached to a mobile credential, so this is a pre-requisite for using Mobile Connect with Aperio BLE enabled doors.

This key contains a diversified version of the site's Aperio site key, along with an encrypted copy of the user's mobile credential ID. This data together is required by the Aperio door to identify the user and let the Gallagher system make an access decision.

This key exists for all mobile credential users if the site key has been generated. It can also be removed for all mobile credential users if the site key is removed. This key does not expire but can be deactivated in Command Centre as part of the mobile credential.

6.1 Aperio Key Delivery

When the Aperio site key is first generated on the Command Centre server:

1. An Aperio key is generated for all active mobile credentials.
2. The Aperio key is end-to-end encrypted for each mobile and sent to the cloud for delivery.
3. The Command Centre Cloud service stores the encrypted key until the mobile device becomes available. A push notification is also sent to the phone.
4. When the Mobile Connect app is next opened manually or via the push notification, the Aperio key will be retrieved and stored for the mobile credential.

When a mobile credential is created on the Command Centre server after the key is generated, the above process is followed similarly.

When the Aperio site key is removed from the Command Centre server, the above process is followed for all active mobile credentials, but a delete message is sent instead. The Aperio key will be removed from Mobile Connect when this message is received.

6.2 Authentication over BLE

Mobile Connect communicates over Bluetooth LE technology with compatible Aperio doors for requesting access. This communication emulates the DESFire card protocol with AES-128 encryption on protected data similar to physical DESFire cards.

To prevent tampering of the virtual DESFire card data at any stage, the payload – mobile credential ID, is generated on the Command Centre server and encrypted (AES-128) with the site key. This encrypted payload is what is received by the controller, such that any tampering of the payload results in unusable data.

On Aperio doors with two factor authentication (2FA) enabled, during the authentication process, the user will be prompted with their mobile device's screen lock for the second factor. Users that have not set a screen lock will have an error message and will not be able to meet the 2FA requirement.

7 Gallagher Cloud Services Technical Details

Currently, there is a single (logical) endpoint, located in Sydney, Australia.
Internally we employ multiple redundant servers for failover and scalability.

It has the DNS (Domain Name Server) address **commandcentre-ap-southeast-2.security.gallagher.cloud**

It has two static IP addresses: **52.62.211.7** and **54.79.91.203**

Communications with cloud services take place solely using HTTPS over the standard port **443**

Gallagher cloud services use TLS client certificates to securely and uniquely identify each individual Command Centre server. The client certificates are issued by the cloud to each Command Centre server the first time it connects.

Note: The same Gallagher Cloud Services also provide Mobile Push Notifications functionality for the Command Centre Mobile Application. For more information, please refer to the document titled **"Gallagher Command Centre Mobile App – Security Technical Information Paper"**

7.1 Firewall Recommendations

Configure your firewall to allow TCP outbound traffic on port 443 with a source of your internal Command Centre server, and destination of the above DNS or IP addresses. If you are configuring firewall rules based on IP address, please allow **both** static IP addresses.

You do not need to allow any inbound traffic to your Command Centre server.

8 Data Storage and Retention

8.1 Mobile Devices

The Mobile Connect app stores the following data locally on the phone:

1. Mobile Credential Display/Diagnostic Information:
   - The name of the site a cardholder has registered against
   - The date they registered.
   - The authentication method they selected for second factor

   This information is not encrypted at rest. Mobile operating systems provide sandboxing which prevents other applications and most casual attackers from reading it.
   Note: The displayed site name is configurable. It can be altered or left blank if a site does not wish this information to be shown or saved.
2. Secure Mobile Credential Information, which consists of the FIDO credential information and private keys.
   This information is stored by FIDO certified authenticator components. It is stored using hardware secure storage and encryption on devices which support this, or otherwise the best available encryption and storage option for a given device.
3. Received Broadcast notification messages.
   - The notification message text
   - The date and time the notification was received
   - The name of the site which sent the notification.

   This information is not encrypted at rest. Mobile operating systems provide sandboxing which prevents other applications and most casual attackers from reading it.
   Note: The displayed site name is configurable. It can be altered or left blank if a site does not wish this information to be shown or saved.
4. SALTO Key data if configured
5. Digital ID card data if configured.

Data is retained on the mobile device until the cardholder deletes it.

To delete mobile credential data, a cardholder can use the Settings screen in the app to delete a credential for a specific site, or they can uninstall the entire app.

To delete broadcast notification messages, a cardholder can delete the messages by swiping them on the notifications list screen within the app, or they can uninstall the entire app.
Note: Deleting a mobile credential does not delete the broadcast notification messages that were received while the credential was active. The cardholder may delete these manually.

Note: Technical details related to the Mobile Connect Apps are subject to change. It is recommend you refer to the latest revision of this document, which can be found here:
https://gallaghersecurity.github.io/r/mobileconnect-cloud-and-app-security

8.2 Cloud Services

Gallagher Cloud Services encrypt Broadcast Notification contents, SALTO keys and Digital ID data at rest using AES-256 or better. SALTO Keys and Digital ID data are additionally protected by End-to-End encryption where the issuing Command Centre server is running version 8.40 or higher.
Other data is not encrypted at rest.

The credential information pertaining to registrations is secure without needing encryption due to FIDO's use of public key cryptography (refer to the FIDO section for more information on this.)

For each Command Centre server that connects to the cloud, the cloud retains the following:

- Server serial number (note the server name is NOT retained)
- Server licensing information
- A TLS client certificate used to authenticate connections from that server.
- Information about any in-progress or successful mobile device registrations, consisting of:
  - Random credential identifier UUIDs
  - FIDO Public Key(s)
  - *Note: Expired or failed mobile device registration information is deleted after the configurable expiry period*
  - *Note: registered mobile credential data is retained until it is requested to be deleted by either the Mobile Connect app, or the Command Centre server. It needs to be stored to enable broadcast notifications to work securely.*
- Any un-downloaded broadcast notification messages, SALTO keys or Digital ID data for mobile credentials associated with the Command Centre site.
  The Mobile Connect app downloads notification messages, SALTO keys and Digital ID data every time it is launched. Once downloaded, this data is removed from the cloud.

  If the Mobile Connect app is not launched, un-downloaded notification messages and SALTO keys will be removed after 7 days.
  The most recent un-downloaded Digital ID update is always retained; however Digital ID data is always end-to-end encrypted, so this is never readable by Gallagher or any other party.
- Command Centre also periodically sends a count of active mobile credentials for licensing purposes.

This information is the minimum required for the solution to function, and it is retained until you no longer wish to use the Gallagher Cloud Services.

8.2.1 Removing individual mobile credential data from Gallagher Cloud Services

When you use Command Centre to remove a mobile credential from a cardholder, the Command Centre server will queue a request to instruct the cloud to delete the credential, and anything associated with it (FIDO public keys, Broadcast Notification messages, SALTO keys, Digital ID).
Your Command Centre server must have an active internet connection for this delete request to be delivered to the cloud, otherwise it will be queued until an internet connection is available.

When a cardholder deletes their Mobile Credential using the settings screen in the Mobile Connect app, their phone will tell the cloud to also delete the corresponding credential and associated data. The delete function requires an internet connection.

Note: If you uninstall the Mobile Connect app, it is not given the opportunity by the mobile operating systems to contact our cloud. As such you will need to remove the credential through Command Centre if you are concerned about this.

8.2.2 Removing all information about your site from Gallagher Cloud Services

It was previously the case that deleting the Cloud FT Item from within the Command Centre configuration client would request the Gallagher Cloud services to remove all data related to the site. After July 2018, this is no longer the case – regardless of the Command Centre server version installed on a given site.

Deleting the Cloud FT Item within Command Centre will now send a message informing the Gallagher Cloud to release the license serial number (to allow for server migrations and upgrades) however all other data is retained.

Command Centre 8.00 adds a "Delete Cloud and Purge Data" feature, accessible on the "Advanced" tab of the Cloud FT Item configuration dialog. You can use this to request that all information referred to by this document about the site is removed from Gallagher Cloud Services. The purge data feature does not work if the Command Centre server does not have an active internet connection.

Important Note: If you use the purge data feature to remove the cloud connection, and then later re-establish a connection to the cloud, then any mobile credentials issued before the purge will not be known to the cloud. **This means those credentials will fail to receive broadcast notification messages and SALTO keys**. If you wish to correct this, you must re-issue those credentials.

Note for older sites: The purge data feature is available in version 8.00 or newer of the Command Centre software. If you have not or are not able to upgrade your server to version 8.00 or newer but would still like your data to be deleted from the Gallagher Cloud Services, please contact privacy@gallagher.com or by using any of the methods listed on the Gallagher website at https://www.gallagher.com/privacy

If you email, please use a subject line containing the terms "Mobile Connect Cloud Services" in order to help us process your request more quickly.

Note: Technical details related to the cloud are subject to change. It is recommend you refer to the latest revision of this document, which can be found here: https://gallaghersecurity.github.io/r/mobileconnect-cloud-and-app-security

8.2.3 Cardholder Personal Information

Cardholder email addresses are never persisted by the cloud. It receives them from Command Centre and immediately discards them after sending an email.

Cardholder mobile phone numbers are stored for the minimum amount of time to allow for registration.

- When a cardholder completes the registration process using the Mobile Connect app, the cloud immediately deletes the corresponding mobile number.
- When a registration expires, the cloud immediately deletes the corresponding mobile number.
- When a registration is cancelled, the cloud immediately deletes the corresponding mobile number.

Note: *The above is the deletion policy for the active database, however mobile numbers may be persisted in database backups for longer periods than this.*

9 Data Transmission

Data transfer between Mobile devices and Reader hardware is not encrypted as no private information is sent. Authentication is secured by FIDO.

All other data transfer between Command Centre, the Cloud and Mobile devices uses encrypted HTTPS. We support TLS 1.2 and TLS 1.3; Older protocols are disallowed which mitigates most encryption-related security risks. You can view the SSL Labs industry standard report here:

https://www.ssllabs.com/ssltest/analyze.html?d=commandcentre%2dap%2dsoutheast%2d2.security.gallagher.cloud&latest

Communication between Command Centre and the Cloud servers is authenticated using TLS client certificates (2048-bit RSA).

Communication between Mobile devices and the Gallagher Cloud is authenticated using FIDO (P256 Elliptic Curve).

10 Security Controls

10.1 Mobile Devices

Security, Access Controls, and Isolation are provided by mobile operating systems and hardware.

10.2 Cloud Services

Our cloud services are securely hosted using Amazon Web Services. They are isolated from other Gallagher or external services using an AWS (Amazon Web Services) Virtual Private Cloud.

Strict firewall and access control rules are in place protecting all administrative functions and other endpoints.

All administrative users accessing our cloud infrastructure require two-factor authentication and strong passwords.

Services within the cloud environment are only allowed access to the minimum set of resources they require to function (for example: they are only allowed to connect to the specific database / key storage they require and cannot access resources for any other services).

Platform security updates are applied daily as required. We employ automated scanning tools which alert if any third-party software components we use are identified in a vulnerability database such as (but not limited to) the public CVE database.

Regular external penetration tests, system hardening, and audit logging are all in place to provided verification and assurance.

11 Monitoring and Response

We employ automated analysis of both application and database logs, continuous monitoring of CPU, Disk and network resource usage and application-specific health monitoring.

Alerts are automatically generated and immediately sent to Gallagher. These alerts, along with service status, are monitored 24 hours per day.

Notice of any incidents or outages that may affect customers will be provided via our Channel Partners, or a direct email alert system, which customers may sign up to by contacting their Channel Partner.

12 Security and Penetration Testing

Gallagher employ internal security and penetration testing staff, who hold a number of security certifications.

Our internal security staff hold a key role in the development of our cloud services, providing expertise, security reviews and internal penetration testing.

An external specialist security company will be engaged to do a comprehensive review annually, or more frequently with each major release as required. Prior reviews have been conducted by Insomnia Security, and executive summaries of the findings are available by request.

We are open to customer or otherwise externally arranged penetration testing, however we require advance notice and approval from Gallagher to avoid disruption of our services which may impact other customers.

13 FIDO and public key cryptography based security

In order to provide a secure solution:

- Phones must be able to identify themselves to Controllers (via a reader)
- Controllers must be able to prove that the phone's identity is legitimate
- Controllers must be able to prove that data sent from the phone has not been tampered or misused.

13.1 FIDO

Gallagher Mobile Connect uses the FIDO UAF protocol for identification and authentication to provide security when access is attempted by a cardholder using their mobile device.

FIDO is an acronym for **F**ast **ID**entity **O**nline. It represents a set of open, interoperable and secure specifications for online authentication. It is managed by the FIDO alliance (https://fidoalliance.org/) which is an open group consisting of companies including Microsoft, Google, Intel, MasterCard, Visa and many others.

UAF is an acronym for **U**niversal **A**uthentication **F**ramework, and is a FIDO protocol designed to authenticate users to services using public key cryptography instead of traditional methods such as passwords. It aims to provide improved security and usability through support for biometric, PIN and other convenient forms of authentication.

The FIDO UAF protocol has gained wide acceptance as being secure, reliable and resistant to many forms of attack. As an open protocol, the specifications are publicly available, and as such have been scrutinised and reviewed in great detail by many parties.

13.2 Public Key Cryptography

The full details of public key cryptography are outside the scope of this document, but it can be summarised roughly as follows.

- To identify something, a pair of large numbers is generated which are mathematically linked together. These are called **keys**.
- Each of the keys can be used to encrypt, or generate a signature for a set of data, which the other key can be used to decrypt or verify.
- The mathematics is such that given one key, it is not practically possible to discover the other, so one key is safe to distribute without requiring additional encryption.
- Given this property, one key is designated as the **private key** and kept safe. The other is designated as the **public key**. Copies of the public key are sent to other parties we wish to communicate with.
- The private key can be used to generate a signature for a piece of data, which is sent along with that data. The public key can be used to verify the data. The mathematics formally prove that the data originated with the private key, and that it has not been tampered with.
- Encryption can also be performed, but this is not needed by FIDO, so does not warrant further explanation.

Public Key Cryptography is also known as asymmetric cryptography, referring to the two sides of the conversation both holding different keys.

13.3 Cryptography principles applied by Gallagher Mobile Connect

The FIDO UAF protocol applies these principles as follows:

At registration time:

- The phone generates a public and private key pair (Elliptic Curve P-256).
- The public key is sent from the phone to Command Centre, which saves it, and makes it available to controllers for later use.
  Sending the public key to the controller is the primary reason for having a registration process.

  At access time:

- The phone signs some data with its private key and sends the data and the signature.
- The Controller uses the corresponding public key (which it obtained during registration) to verify the signature and the data. This securely proves that the phone is the correct one and the data is legitimate.

A number of points arise from this approach:

1. An attacker being able to clone the credential depends on their obtaining a copy of the private key. It is important to keep it safe.
2. The public key can only verify the phone, not impersonate it. As such, it is not considered sensitive information, and if it happens to get copied, intercepted or otherwise made available to malicious third parties, the credential still remains secure.
3. Only the public key needs to be transmitted. The private key can remain securely on the device. This greatly reduces the ability for any malicious third parties to intercept or gain access to it.
4. If hardware secure storage is available, the private key can be stored in this secure hardware. In these situations, the private key never leaves this secure hardware chip for any reason.
5. For an attacker to clone or compromise a credential, they must:
   a. At bare minimum have physical access to your phone
   b. Modify its operating system to circumvent the phone's built in security defenses.
   c. If hardware secure storage is used, even this will not reveal the private key. An attacker must resort to physical attack methods such as removing the secure hardware chip and physically opening it, which may destroy the chip entirely.