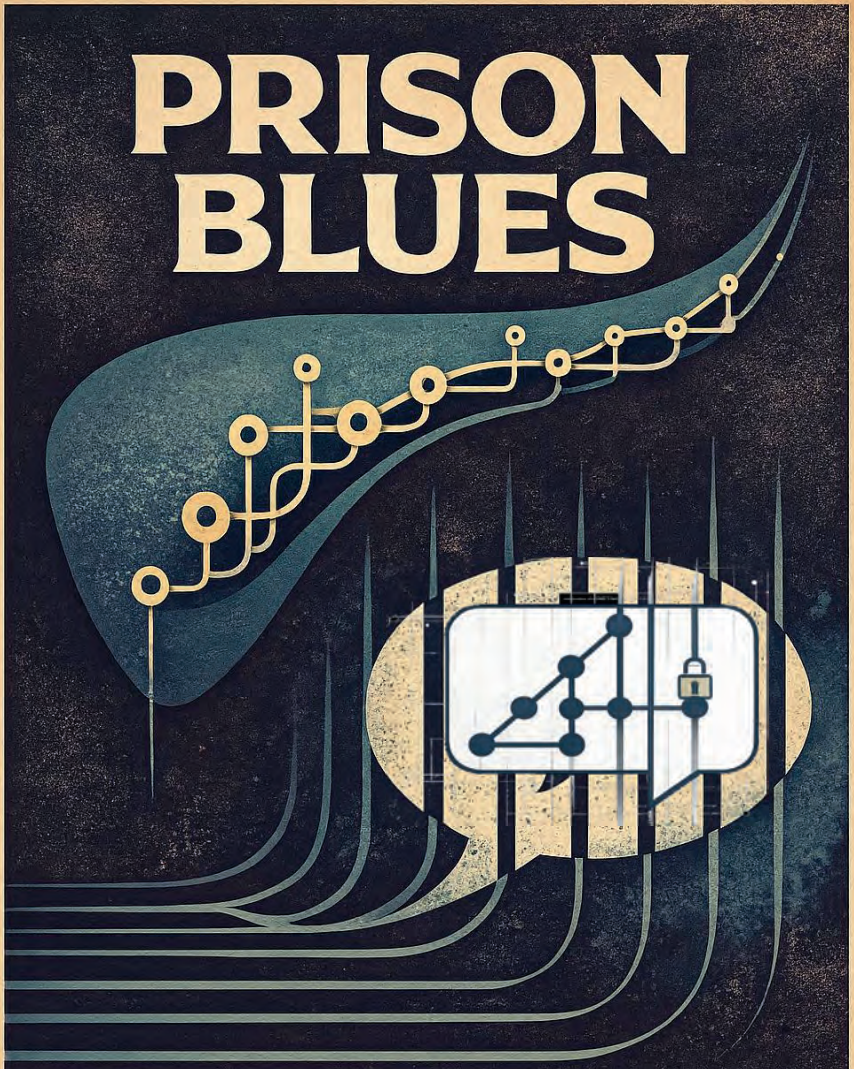
PRISON BLUES



COVERT ENCRYPTED MESSAGING OVER GIT

PRISON BLUES turns one of the world's most ordinary developer tools into something unexpected: a covert, end-to-end encrypted message channel that looks like routine code collaboration.

Inside the Spot-On encryption suite, Prison Blues treats a Git repository as an asynchronous message bus. Messages become encrypted files. "Sending" becomes committing and pushing. "Receiving" becomes pulling and decrypting. The result is a resilient, store-and-forward communication method designed for environments where conventional messengers are blocked, monitored, or simply too risky—yet Git traffic still passes as normal.

This manuscript is an accessible deep dive into how the idea works, why it's useful, and where its edges are. It doesn't romanticize "stealth"; it confronts the real operational realities of Git-based transport—metadata leakage, timing signals, server availability, and the practical constraints of platforms and tooling. If you care about censorship resistance, secure collaboration, and threat modeling beyond the ciphertext, *Prison Blues* offers a blueprint for thinking clearly about all three.

You'll explore:

- Git-as-transport architecture (commit / push / pull as messaging primitives)
- Defense-in-depth encryption (Spot-On plus optional GPG workflows)
- Security trade-offs: auditability vs. exposure, persistence vs. deniability
- Real-world use cases: "digital dead drops," private bulletin boards, and restrictive networks.

"When all else is watched, try Git for Chat."

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Impressum

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“When all else is watched,
try Git.”

Content

Foreword: Prison Blues in Spot-On Encryption Suite

Tools shape behavior—and sometimes they do something else entirely. Git was built for collaboration: a way to track changes, share work, and preserve history. Yet its very strengths—ubiquity, reliability, and "normal-looking" network traffic—also make it an unexpectedly effective carrier for something more sensitive: private communication.

Prison Blues explores that idea with clarity and technical seriousness. It presents a communication subsystem within the Spot-On encryption suite that treats an ordinary Git repository as an asynchronous message bus: participants "speak" by committing and pushing encrypted payloads, and they "listen" by pulling and decrypting what arrives. In other words, secure messaging is made to resemble routine code collaboration.

Figure 1: PRISON BLUES – Encrypted Messaging within Spot-On Encryption Suite.

The core proposition is straightforward: strong cryptography first, plausible deniability second. The repository is merely the transport and the storage medium; the protection of meaning remains end-to-end, grounded in Spot-On's cryptographic design and, where appropriate, augmented by GPG in Rosetta workflows. What changes is the operational profile. Instead of opening chat ports or relying on specialized messaging infrastructure, *Prison Blues* rides on pathways that many organizations already permit—sometimes even encourage.

That shift matters. In restrictive networks, the problem is often not whether encryption exists, but whether encrypted traffic is allowed to exist. A Git-based channel can survive where conventional messengers fail, precisely because it looks like one of the most common forms of legitimate technical activity. It also introduces a different rhythm: store-and-forward rather than real-time conversation; persistence rather than ephemerality; a ledger-like history rather than transient packets.

Of course, every design is a trade. Git's strengths come with edges: metadata leakage in commit histories, timing signals that can enable traffic analysis, operational overhead in repository management, and a central point of availability if a single server is used. This book does not romanticize those risks; it brings them into the threat model and treats them as first-class design constraints, not afterthoughts.

Finally, a word about responsibility. Any resilient communication technique can be used to protect the vulnerable—or to conceal harm. The value of *Prison Blues* lies in understanding systems: how to design for censorship resistance, how to separate content secrecy from transport assumptions, and how to evaluate real-world security. Read it with that mindset. The intent should be defense, privacy,

and human safety—especially for those operating under surveillance, coercion, or institutional constraint.

If you have ever wondered what it means to "re-purpose infrastructure" for secure communications—without relying on magical thinking—this book is a practical, thought-provoking answer.

A covert channel in plain sight

Prison Blues is a technical deep dive into an unconventional but elegant concept: using Git repositories as a secure, asynchronous transport for encrypted messages inside the Spot-On ecosystem. Instead of sending chat messages through obvious channels such as XMPP, email, or direct peer-to-peer sockets, participants write encrypted payloads to disk, commit them into a shared repository, and synchronize them through standard Git operations. Peers then fetch those updates, decrypt the payloads locally, and present the plaintext in familiar interfaces.

This approach reframes the repository as a persistent message queue—one that can live on a public platform, a private enterprise Git server, or a self-hosted instance. It also reframes the act of messaging as ordinary collaboration activity: commits, pushes, pulls, and a history of changes.

Where it fits inside Spot-On

Spot-On is not a single-protocol messenger. It is a suite that offers multiple ways to exchange information securely, each adapted to different constraints: direct peer-to-peer communications (Echo), email-based transport (POPTASTIC), and offline/manual encryption workflows (Rosetta CryptoPad). *Prison Blues* adds a fourth option—one designed for environments where "normal messengers" are blocked or scrutinized, but Git traffic remains acceptable.

In that sense, this book is about more than Git. It is about transport diversity as a security strategy. When adversaries can disrupt or profile one channel, your resilience comes from having several credible alternatives—each with different operational signatures and failure modes.

How Prison Blues works at a high level

At the heart of the system is a simple lifecycle:

1. **Encrypt locally.** A message is encrypted end-to-end before it ever leaves the client.
2. **Commit and push.** The encrypted payload is stored as a file in a working directory, then committed and pushed to a remote Git repository.
3. **Pull and decrypt.** Other participants periodically fetch new commits, identify new message files, and decrypt them into readable form.
4. **Manage what persists.** Git history remains unless rewritten, but clients can reduce clutter locally by purging processed files or using dedicated directories and conventions.

The result is **store-and-forward secure messaging** that behaves more like email or a forum than a live chat socket—yet still integrates into Spot-On's messaging experience.

Two modes, different missions

A key theme in this book is that Prison Blues is not one monolithic feature; it is a transport used by distinct workflows:

- **Chat-style messaging**, where Spot-On's internal messaging encryption drives the experience.
- **Rosetta-based messaging**, where users may leverage GPG for additional encryption and

signatures, exchange key bundles, and handle “slow chat” or structured secure data exchange.

Understanding these modes matters because they influence not only usability but also operational risk: what metadata might appear, how authenticity is verified, what kinds of payloads are practical, and which Spot-On features are intentionally excluded (for example, time-sensitive “calling” messages that don’t translate well to an asynchronous repository model).

Security is more than ciphertext

One of the most important contributions of *Prison Blues* is its insistence that secrecy is not the same as invisibility. Even when content is strongly encrypted, systems can leak:

- **Timing and frequency patterns** (who commits when, how often, and how quickly others respond)
- **Repository membership and access logs**
- **Commit metadata** (author identity, timestamps, file naming conventions)
- **Operational traces** on endpoints (local repo artifacts, working directory remnants)

This introduction sets the expectation that the pages ahead will treat security as a full-stack problem: cryptography, transport security (SSH/HTTPS), server trust boundaries, metadata minimization, and realistic threat modeling under censorship and surveillance.

Who this essay-book is for

This essay is written for readers who want to understand (or deploy) secure communications in constrained environments, including:

- security engineers and privacy practitioners
- researchers studying censorship resistance and covert channels
- journalists, NGOs, and high-risk operators who need reliable store-and-forward messaging
- technically capable users who already understand basic Git workflows and want a secure alternative transport

You do not need to be a cryptographer to follow the main ideas, but you will benefit from familiarity with:

- public-key encryption and digital signatures
- the basics of Git repositories, commits, and remotes
- operational security thinking (threat models, side channels, and failure modes)

How the book is structured

The chapters that follow move from concept to implementation realities:

- a clear overview of the Prison Blues idea and its motivation
- architecture and protocol behavior (what happens on send/receive)
- operational requirements and platform constraints (including practical considerations for Windows)
- the security model: what is protected, what can leak, what can fail
- comparisons with other Spot-On transports and features

- real-world use cases, deployment scenarios, and limitations

By the end, you should be able to decide whether Prison Blues fits your environment—and, if it does, how to approach it with eyes open: appreciating both its resilience and its boundaries.

A final framing

Git-based messaging is a reminder of a broader principle: secure systems don't always need exotic infrastructure. Sometimes they need careful engineering, conservative assumptions, and a willingness to use what the environment already permits.

That is the spirit of *Prison Blues*: not "security by obscurity," but security *with* operational plausibility—strong encryption delivered through an unexpectedly ordinary path.

Uni Nurf, in December 2025.

Prison Blues: Encrypted GIT-Based Messaging in Spot-On - Overview

Prison Blues disguises secure messaging as ordinary code collaboration. By leveraging standard Git repositories as an asynchronous message bus, it enables covert encrypted chat and data exchange even in environments where only Git protocols are allowed.

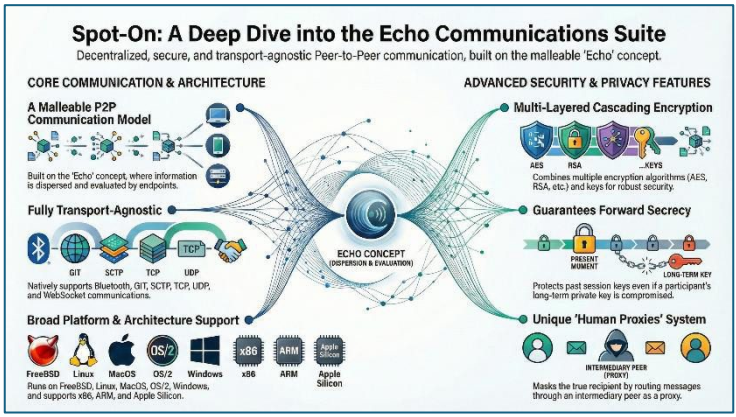


Figure 2: Spot-On Echo Communications Suite.

Prison Blues is an innovative communication subsystem within the Spot-On encryption suite that uses Git servers for message exchange. Introduced as a covert channel in Spot-On (circa 2024–2025), its design philosophy is to **masquerade secure messaging as code collaboration activity**. Instead of sending messages over typical chat or email protocols, participants commit and push encrypted messages as files to a shared Git repository, and peers pull those updates to receive messages. This approach provides

a decentralized, persistent message queue on any Git server (public or private), effectively **turning a repository into a bulletin board for encrypted chat**. By piggybacking on the ubiquity of Git infrastructure, Prison Blues can operate in restrictive networks where conventional chat ports or custom P2P traffic might be blocked, under the guise of normal version control traffic.

Role in Spot-On: Prison Blues complements Spot-On's array of communication methods. Spot-On already supports direct P2P messaging (the Echo protocol), email-based messaging (the POPTASTIC feature), and offline manual encryption (Rosetta CryptoPad). Prison Blues adds another option: **asynchronous Git-based messaging**, which is especially useful when direct peer-to-peer connectivity is infeasible or when one wants to exploit Git channels for stealth. In essence, Spot-On treats Git as just another transport layer (alongside TCP, UDP, Bluetooth, etc.) – but one with unique properties (asynchronous, server-mediated, auditable history). The feature's quirky name "Prison Blues" evokes the concept of constrained communication (like clandestine notes passed within a prison), reflecting its purpose to enable messaging under heavily controlled conditions.

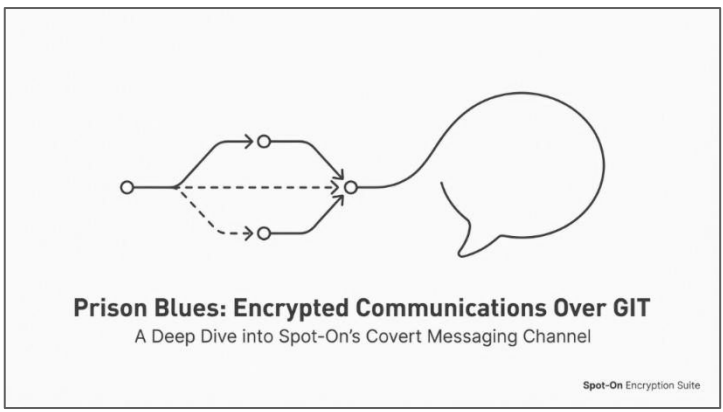


Figure 3: Prison Blues.

Origins: Spot-On's documentation and release notes indicate Prison Blues was implemented in early 2020s as an experimental feature. It followed the earlier POPTASTIC (encrypted chat over email servers) introduction and was quickly refined over several releases, adding support for multiple repositories and Windows compatibility. By now, Prison Blues became a fully integrated part of Spot-On, with dedicated configuration options and documentation https://textbrowser.github.io/spot-on/. Its development was likely driven by the need for a **covert, store-and-forward messaging channel** resilient to surveillance and censorship – Git being an attractive choice due to widespread adoption in enterprise and development environments, meaning Git traffic might not arouse suspicion.

Architecture & Protocols

At its core, Prison Blues operates by treating a Git repository as a shared mailbox or drop-point for encrypted messages. The architecture involves **clients (Spot-On instances) that perform Git operations** behind the scenes and a **Git server (or servers) hosting the repository**. The protocol can be summarized in the following steps (for a typical message exchange):

1. **Message Preparation:** When a user sends a chat message or data via Prison Blues, Spot-On encrypts the content locally. For standard chat messages, Spot-On uses its internal hybrid cryptographic scheme (combining asymmetric and symmetric encryption with integrity checks) as it does for other Echo communications. For Rosetta messages (explained below), GPG may be used for an additional encryption layer. Each message (ciphertext or attachment) is then saved as a file respective text string in a local Git working directory associated with the shared repo.

2. **Commit & Push:** The Spot-On client executes a Bourne Shell script (named spot-on-git.sh) to interface with Git. This script stages the new message file, commits it (using a preset Git identity like "prisoner@blues.org"), and pushes the commit to the remote repository. Each message results in a new commit in the repo's history. The commit contains the encrypted payload as a blob, and the commit metadata (author name/email, timestamp, commit hash) serves as an immutable log of the message's existence.

3. **Fetch & Decrypt:** Other participants' Spot-On clients periodically fetch (pull) from the repository to check for new commits. When a new commit is detected, the encrypted files are pulled into the local working copy. Spot-On then decrypts the contents and delivers the plaintext to the user's chat interface (or Rosetta interface, depending on message type). After processing, the Spot-On client may purge or delete the processed message files from the working copy to avoid re-processing or clutter (the history remains in Git unless pruned manually).

4. **Asynchronous Flow:** This commit-and-poll mechanism is asynchronous. There is no persistent socket between clients; instead, the Git repo acts as a **mediated dropbox**. Message delivery latency depends on how frequently clients push and pull. In practice, Spot-On's kernel automates periodic pulls (with tunable frequency) so that new messages appear with modest delay, though it's not instantaneous real-time. This design makes Prison Blues closer to an email/forum model (store-and-forward) than an interactive socket chat. However, unlike email, the message store is shared and

append-only, giving all participants a consistent log of conversation (assuming they have repo access).

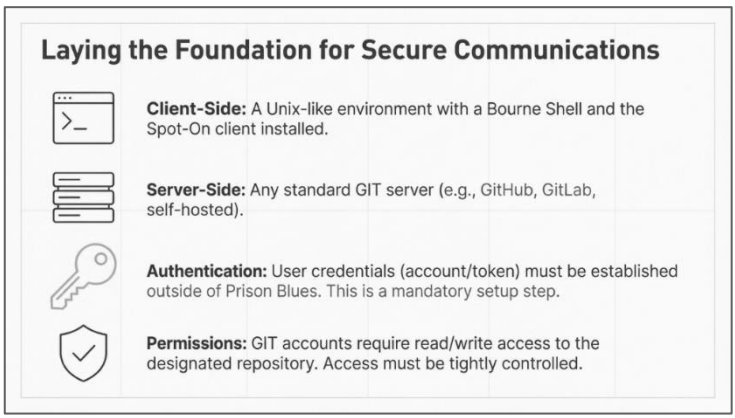


Figure 4: Foundations for Secure Communications.

Repository Structure & Metadata: By default, the repository used for Prison Blues can be a private Git repository (e.g., on GitHub, GitLab, or a self-hosted server). Each message is typically stored as a separate file (for example, the file name might encode the sender or a message ID). Spot-On might use branch or file naming conventions to avoid merge conflicts – for instance, writing each message to a uniquely named file (possibly derived from a message GUID or timestamp) so that multiple users' commits don't edit the same file concurrently. The *Spot-On documentation hints that messages will "arrive in some order" in both Chat and Rosetta, and that only standard chat messages ("messaging messages") appear in the Chat tab.* This suggests that all new message files are interpreted and routed by their type: chat text goes to Chat UI, other content (e.g. key bundles, status notes) goes to Rosetta UI.

One important aspect is **metadata exposure**. While the message contents are encrypted, certain Git metadata is in plaintext on the server: commit timestamps, author

names/emails, file names, and repository membership. For example, if all users use the default identity "prisoner@blues.org" as recommended, the commits won't reveal real names, but an observer of the repo can still see when commits happen and their hashes. If custom identities are used, they could potentially reveal user-chosen pseudonyms or patterns. The Spot-On developer acknowledges this: *the commit log is an auditable history, and although content remains confidential, some timing and frequency information inevitably leaks through Git's logs*. To mitigate risks, it's advised to use a repository with access restricted to the communicating parties and to use innocuous commit identities (the default "prisoner" identity, or any agreed alias) to avoid drawing attention.

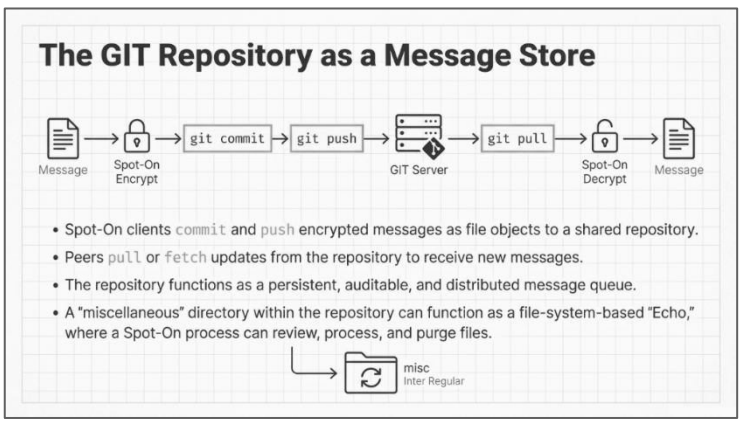


Figure 5: Storing Messages in GIT.

Git as Transport vs Echo: Notably, Spot-On's Echo protocol normally floods encrypted messages through a network of peers in real-time (no central server). Prison Blues diverges from that by using a **central (or federated) Git server** as the rendezvous point. In a sense, Prison Blues implements an "Echo on the filesystem" – Spot-On treats the repository as an Echo-like medium where each new file/commit is

analogous to an echo message broadcast. The documentation even refers to "an Echo on the file system" when describing how Spot-On monitors and purges files in the repo. However, unlike true network echo, here the distribution is handled by Git's client-server model (which could itself be multi-hop if the Git server syncs across mirrors, etc., though that's not inherent). The advantage is reliability and persistence: messages don't vanish and can be fetched later if a recipient was offline. The trade-off is increased latency and reliance on the Git infrastructure's availability.

Encryption Layers: Prison Blues employs multiple layers of encryption to secure messages:

- **End-to-End Content Encryption:** The actual message payloads are encrypted such that only intended recipients can decrypt. In Chat mode, Spot-On likely uses the symmetric session keys established via its normal key exchange with your friends (Spot-On supports RSA, NTRU, McEliece, etc., so a hybrid AES + public-key scheme secures chat messages). In Rosetta mode, Spot-On can leverage GPG for content encryption and digital signatures on messages and attachments. Essentially, Prison Blues is transport-agnostic about *what* it carries; it ensures the content is already encrypted either by Spot-On's internal cryptosystem or GPG by the time it hits the Git repository. GPG integration means users can optionally treat a Prison Blues message like an email: Spot-On will invoke GPG (via GPGME) to encrypt/sign the message to the recipient's public key, providing a second layer of end-to-end encryption on top of Spot-On's own encryption. This double-encryption may be used for Rosetta's secure pad messages or when sharing GPG key bundles.

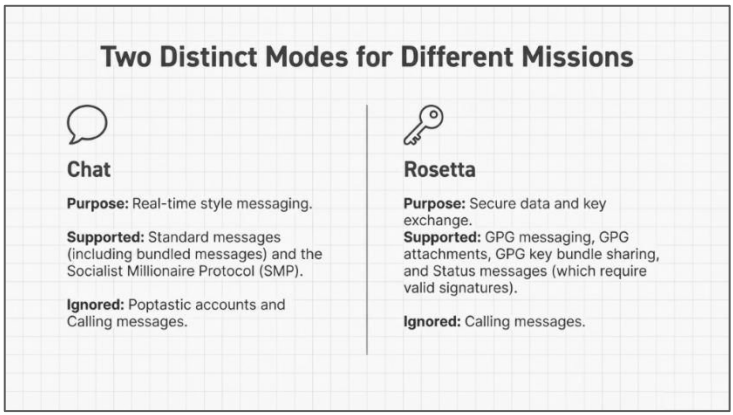


Figure 6: Sending Gitty-Chat from Rosetta.

- **Transport Security:** The communication with the Git server can itself be protected by standard Git transport security. Typically, Git uses SSH or HTTPS. If SSH keys are used or if the Git server is accessed over SSL/TLS, then the push/pull traffic is encrypted in transit as well. This is external to Spot-On (handled by Git and the server), but it means an eavesdropper on the network won't easily inspect even the encrypted blobs en route. With HTTPS, server authentication and confidentiality are provided, and with SSH, both server and client are authenticated. *In short, the channel to the server can be secured using the same practices as any Git usage (e.g., GitHub over SSH/HTTPS), adding another layer of protection beyond the message encryption*.

- **File-System Echo (Local)**: When Spot-On fetches new files from the repo, it may locally treat them akin to incoming messages on an "echo" channel. The mention of a *"miscellaneous" directory in the repository that may house data for Spot-On to review and purge* implies that Spot-On could use a specific

folder (perhaps named misc/) for certain types of content (attachments or temp data). This folder acts as a staging area; Spot-On monitors it and performs cleanup. For example, once an attachment file is processed (decrypted and handed off), the client might delete it from the working copy and commit a removal to the repo, or simply ignore it henceforth. This ensures that the repository doesn't grow indefinitely with redundant data and that clients don't repeatedly process the same file. It's a way to emulate ephemeral messaging: though Git history never truly forgets, Spot-On can be configured not to show or reuse older processed items.

Metadata Handling: One clever aspect is how Spot-On handles presence and addressing without leaking info. In a typical P2P echo, each message is encrypted to specific recipients: with broadcast and only the intended can decrypt. In Prison Blues, if all participants have access to the repo, one might consider that *anyone with repo access sees all encrypted messages*, even those not intended for them. Spot-On likely deals with this by encrypting each message payload to the recipient's key (or a symmetric key known only by the conversing pair/group). If multiple parties share a repository (like a group chat), they might either (a) use a shared symmetric group key (like Spot-On's Buzz group chats do for IRC-style group encryption) or (b) include multiple encrypted blobs for multiple recipients. The manual notes that "Only messaging messages are published in Chat. This includes messages which are bundled within messaging messages (curious)" – which could hint that Spot-On is capable of bundling one message inside another to deliver to multiple parties. However, the exact mechanism is fully documented in the manuals. Regardless, the **addressing of who should read a given file is purely cryptographic** – if you cannot decrypt the file, it's not for you. The Git repo itself does

not label recipients in any metadata (and if GPG is used with throw-keyid option, even the GPG-encrypted message won't reveal the recipient key ID). This ensures that even if an unauthorized person got access to the repository, they could not tell how many parties are communicating or who they are, aside from perhaps guessing by commit patterns.

Protocol Limitations: Certain Spot-On features do *not* translate well to the Git medium. Notably, *"calling messages are not published [in Prison Blues] because they would require strange expiration times"*. Spot-On's "calling" mechanism is an interactive key exchange for establishing a call (like a one-time secure session or a ringing signal for synchronous chat/voice). These messages are time-sensitive and designed to expire quickly (to prevent replay). In an asynchronous repo, there is no way to propagate an ephemeral call request reliably – by the time the peer pulls it, the moment may have passed. Therefore, two-way calling (Spot-On's concept of establishing an instant encrypted channel) is disabled on Prison Blues. If users need to do a real-time messaging call as instant call, they must fall back to a direct connection (Echo or otherwise) established by exchanging credentials out-of-band (e.g., via a normal Spot-On message or manually). Similarly, *"human proxies are not functional"* in Git mode. Human proxies are an advanced feature of Spot-On's live echo network where a friend can forward a message to another on your behalf without reading it (an inner-envelope technique for anonymity, see Nurf 2023/2024 Human Proxies in Cryptographic Networks). This relies on dynamic routing flags in the live network, which simply don't exist in a static repository. Every Prison Blues message appears as originating from the "prisoner" user (or whichever commit identity is used) rather than being forwarded by a friend, so proxying doesn't apply.

In summary, the Prison Blues protocol builds an overlay on Git: **the commit-push-pull cycle serves as the transport,**

the Git repository as the medium, and Spot-On's encryption as the content security. It is asynchronous and robust due to Git's reliability, but it sacrifices the low-latency interactivity and some advanced P2P tricks of Spot-On's native Echo network.

Operational Requirements

To deploy Prison Blues, certain system prerequisites and setup steps are necessary, especially since it leverages external Git tools:

- **Operating System & Dependencies:** A Unix-like environment is ideal. Spot-On requires the ability to execute a Bourne shell script (sh) to perform Git operations. On Linux and macOS, this is straightforward as Git and POSIX shells are readily available (Git is an *optional dependency* in Spot-On's build, meaning Spot-On will include Prison Blues functionality only if Git is present). On Windows, however, native Git support is not readily available. The Spot-On manual explicitly notes, *"Git is not easily available on Windows"*, thus a special configuration is needed (discussed below). Aside from Git itself, GPG is needed if you plan to use the GPG integration (Rosetta GPG messaging). Spot-On can interface with GPG via GPGME; the minimum GPG version required is 2.1 and the gpg binary must be installed and accessible. If using GPG features, each user should also have generated or imported GPG key pairs in Spot-On or externally.

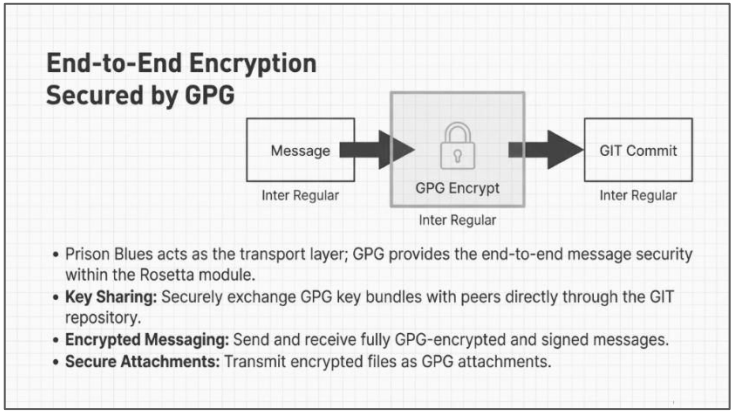


Figure 7: GPG as additional Security within End-to-End Encryption.

- **Repository Setup:** One must have access to a Git server (this could be a private GitHub/GitLab repository, a self-hosted Git service like Gitea, or even just an SSH-accessible bare git repo on a server). It is **strongly recommended to use a private repository** restricted to the intended participants. This ensures that no unauthorized person can clone or push. Each user needs credentials for the Git server. Typically, this means either a username/password (if basic auth over HTTPS is used), a Personal Access Token (for HTTPS with token), or an SSH key (for SSH access). The Spot-On interface provides fields to configure the repository URL, username, and token/password in its Options window. For example, one might create a repository github.com/YourOrg/secret-chat.git and generate unique access tokens for Alice and Bob with push/pull rights. The Spot-On operator should **limit repository access** as much as possible – only the communicating parties should have read/write, no public access. This is the primary access control, since anyone who can pull the repo could obtain the

ciphertext (albeit still encrypted) and anyone who can push could inject data.

- **Local Configuration:** On each client machine, Git must be configured with a dedicated identity for Prison Blues. The documentation suggests setting your ~/.gitconfig user name and email to generic values (e.g., name = prisoner, email = prisoner@blues.org). This is to avoid leaking your real identity in commit metadata and to give a uniform appearance to all participants' commits. Each Spot-On instance will use this identity when committing messages. Additionally, within Spot-On's settings (Options -> GIT), you'll specify the repository URL and credentials (as noted above), and possibly how frequently to poll. Spot-On might also allow configuring multiple repository "sites" – in fact, a release note mentions *"Prison Blues now supports five sites"*, meaning you could set up to five Git remotes (e.g. for redundancy or separate chats). Each site would have its own URL and token.

- **Initialization:** Once Git credentials and config are in place, the **first user** should initialize the repository. This could involve creating the repo on the server (empty) and doing an initial commit (Spot-On might do this automatically the first time you send a message, or you might have to manually initialize it). All other participants then need to have their Spot-On pointed to that repo and do an initial pull. The Spot-On manual outlines a GIT configuration process:

    1. Prepare local Git config (.gitconfig with user name/email).

    2. Enter the repository info in Spot-On's GUI (URL, token, etc.).

3. On the Git server, set up accounts/tokens and repository permissions so only intended users have access.
4. (The manual adds that call messages aren't included and credentials must be exchanged by other means, which we've covered).

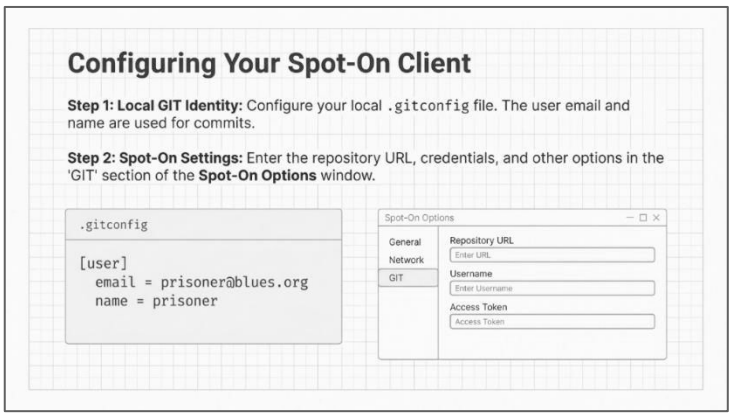
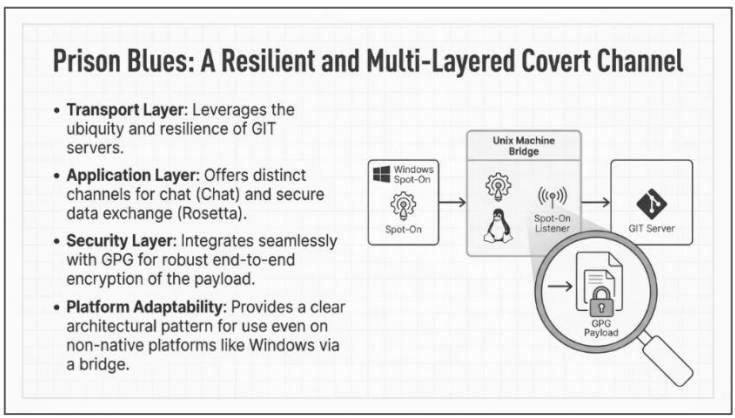


Figure 8: Configurations within Spot-On Encryption Suite.

- **Linux vs Windows:** For Linux (and other Unix-like OSes such as *BSD or macOS), running Prison Blues is straightforward as long as Git is installed. For Windows users, due to the lack of a native POSIX shell environment, **the recommended solution is to use a Unix-like relay**. The Spot-On manual's *Windows Prison Blues* section specifies:
    - Set up a Unix-like machine (even a Raspberry Pi with Linux will do) that has Git and Spot-On installed.
    - Configure Prison Blues on that Unix machine normally (as above).

- Run a Spot-On **listener** on the Unix machine – this is basically a Spot-On node that the Windows client can connect to as a neighbor.
- On the Windows machine, run Spot-On and connect it to the Unix machine's listener as if that were your friend/neighbor.

In practice, the Unix box acts as a **bridge**: it handles all Git push/pull operations and then forwards messages to the Windows client through Spot-On's native protocol (over a socket connection). Windows Spot-On itself doesn't do any Git – it just talks to the Unix Spot-On (which in turn writes to the repo). *This workaround leverages Spot-On's normal encrypted neighbor link (which is supported on Windows via TCP/SSL) to piggyback into the Git network via the Unix node.* The diagram below illustrates this bridging concept:



Multi-layered architecture of Prison Blues, including a Windows client using a Unix bridge to reach the Git server. The bridge runs Spot-On on Linux to perform Git operations (Spot-On listener ↔ Git repo), while Windows Spot-On connects to the bridge as a neighbor. End-to-end encryption (e.g., GPG payload) remains intact through each layer.

Figure 9: Multi-layered architecture of Prison Blues.

This multi-hop setup allows Windows users to participate without a native Git or shell. The trade-off is that the Unix bridge must be online as an intermediary. It could be a small cloud VM or a Raspberry Pi in a network accessible to both the Windows client and the Git server. Notably, using a bridge like this reintroduces some aspects of the Echo network: the link between Windows and the Unix machine is an Echo neighbor link (likely using Spot-On's standard TCP or UDP channel), which could be multi-hop encrypted. However, from the Git server's perspective, there is still only one client (the Unix machine) pushing for both. Spot-On's documentation enumerates these Windows steps clearly, and it emphasizes that the Windows client itself doesn't run Git – the heavy lifting is on the Unix side.

- **Git Repository Management:** Administratively, someone will need to monitor the repository over time. Over long-term use, the repository can grow in size with every message (since Git keeps history). You might periodically prune or archive the repo if it becomes unwieldy, though doing so would require coordination (all users would need to re-clone or reset to the pruned state). The repository could also be rotated (start a fresh repo) if needed. It's advisable to enable Git's garbage collection and possibly to avoid huge binary attachments which would bloat history. The repository acts as a secure log: in contexts where an audit trail is a feature (e.g., leaving an evidence of conversations), one might keep it intact. In other sensitive contexts, one might treat it more ephemerally (prune old commits after certain time). Spot-On itself does not automatically rewrite Git history – those actions, if desired, have to be done manually by a repo owner (which complicates things, since rewriting history would require force pushing and all clients resetting their local copies).

- **Multiple Channels:** If users want separate "channels" or conversations, they can either share one repo and segregate by file namespaces, or use multiple repos. The updated Spot-On option for up to five Git sites suggests that one user can configure up to five different Prison Blues endpoints concurrently. For example, a user could be part of *Repo1* with one group of contacts and *Repo2* with another group. Each would operate as its own messaging space. The UI likely tags messages by which Git profile they came from. This multi-repo support adds flexibility for compartmentalizing communications.

In summary, setting up Prison Blues requires a bit more devops than typical messengers: one has to provision a git repo and possibly a Linux relay for Windows. Once configured, the usage is largely transparent – Spot-On automates the Git commits and pulls. The key is ensuring all participants have matching settings and access and that Git credentials are handled securely (e.g., using tokens, not hardcoding passwords, and revoking access when someone should no longer be in the conversation).

Security Model

Prison Blues' security builds upon Spot-On's core cryptographic model, adding GIT-specific considerations and threat mitigations. **At a high level, it achieves end-to-end encryption, forward secrecy, and anonymity of content, but one must consider server trust and metadata leakage.**

End-to-End Encryption: All messages in Prison Blues are end-to-end encrypted between the participants. If using the standard Spot-On chat encryption, this means each message is encrypted with keys derived from the mutual exchange between the users (Spot-On supports multiple algorithms – e.g., RSA, McEliece, etc. – but whichever is in

use, the message ends up encrypted with a symmetric cipher like AES or Threefish and authenticated with HMAC, layered inside a public-key wrapper). If using GPG within Rosetta, then it's classical PGP encryption: the sender encrypts the message with the recipient's public key and possibly signs it with their private key. In either case, the Git server never sees plaintext. An adversary obtaining the repository cannot read messages without the recipients' private keys.

It's worth noting Spot-On's internal encryption already provides *instant perfect forward secrecy (IPFS)* for calling and an *asymmetric encryption with optional forward secrecy for messaging*. This implies that even if long-term keys are compromised, past messages might remain safe due to ephemeral session keys in each message. Prison Blues inherits this property: each message file could be encrypted with a fresh session key that's further encrypted to the recipient, limiting the blast radius of a key compromise or a single message leak.

Authentication and Integrity: By default, Spot-On messages include authentication (HMAC) and are signed (when using keys) to prevent tampering. In Prison Blues, the repository could be a hostile environment (imagine if an attacker gained push access or the server itself is malicious). The recipients must be able to detect any altered or fake messages. This is ensured by digital signatures or keyed HMACs. For example, if Alice sends a message to Bob, it is either accompanied by a Spot-On signature (using Alice's long-term signing key or an intermediate key) or encrypted in such a way that Bob's ability to decrypt authenticates it (like an HMAC with a shared secret). Spot-On's use of the *Encrypt-then-MAC approach* and digital signatures is documented. Additionally, in Rosetta GPG messaging, standard PGP signatures can be applied. The Spot-On manual explicitly states that *"Status messages [special updates] require valid signatures"* in Rosetta, reinforcing that integrity is always checked. Thus, if a

malicious party tried to inject a bogus commit with fabricated ciphertext, clients would ignore or flag it as it wouldn't have a valid signature from a known friend.

Server Trust and MITM: The Git server is a store-and-forward node. Ideally, it should be trusted not to maliciously withhold or manipulate data, but even if it did, it shouldn't break the security of the encryption. A malicious server could perform a denial-of-service (deleting the repo or refusing to deliver new commits) – but it cannot decipher messages or produce valid new ones. Could it perform a man-in-the-middle? Not in terms of content, because of encryption and signatures. However, if the server colludes with an attacker, they might try replaying old commits or reordering them. Git history is append-only, so reordering is generally not possible without it being obvious (commits are linked via hashes). Replay of an old message as a "new" commit would also be evident because either the commit hash is duplicate or out of sequence. Spot-On's kernel also has *congestion control and duplicate detection* as part of the Echo protocol defenses, which likely means if it sees the same message payload again, it will discard it. Thus replay attacks are mitigated.

Man-in-the-middle at the transport layer (between client and server) can be thwarted by using SSH or TLS for Git. If an attacker intercepts the Git traffic but the user is pushing to git@github.com via SSH, the integrity of that channel is protected by SSH keys. Similarly, for HTTPS with correct certificate validation, MITM on transport results in failure. Even if MITM succeeded (e.g., a fake Git server that both clients unknowingly use), the attacker still only sees encrypted blobs. The worst they could do is drop or delay messages.

Multi-Hop Anonymity: One of Spot-On's hallmarks is multi-hop routing in the Echo network to conceal who is talking to whom (each message is flooded and any node could have

originated it). Prison Blues doesn't inherently use multiple hops *in the Git layer* – everyone pushes to and pulls from the same server, so that server "knows" who the participants are (at least by account). However, the content doesn't reveal the actual sender/receiver identities except perhaps the commit metadata (which we purposely anonymize as "prisoner"). There is an interesting possibility: participants could themselves chain through neighbors to reach the Git server (for example, using a Spot-On neighbor as a SOCKS proxy or something). But the standard approach is the direct use of Git. If anonymity is crucial, one can host the Git repo on an onion service (Tor .onion) or on I2P, etc., or use a chain of proxies for Git. Spot-On's release notes hint at *"Prison Blues remote server"* config and integrating with its networking (e.g., *"GIT and congestion control within the kernel"*), suggesting that Spot-On's kernel might treat the Git server as a special kind of neighbor (so possibly one could connect to it through the Echo mesh). If that's the case, it wasn't heavily documented, but it could allow a scenario where one Spot-On node fetches from the Git and then floods the data to others via Echo. At minimum, **anonymity is maintained on the content level** – observers of the Git repo or network cannot discern social graph or message meaning. The only leak is that commit timestamps and frequency might indicate activity patterns. If using a public Git service, adversaries could see "user prisoner pushed 3 commits at 2am" – which might be incriminating in some threat models. Thus, in high-threat scenarios, self-hosting or using anonymous hosting (with Echo or Tor) is recommended.

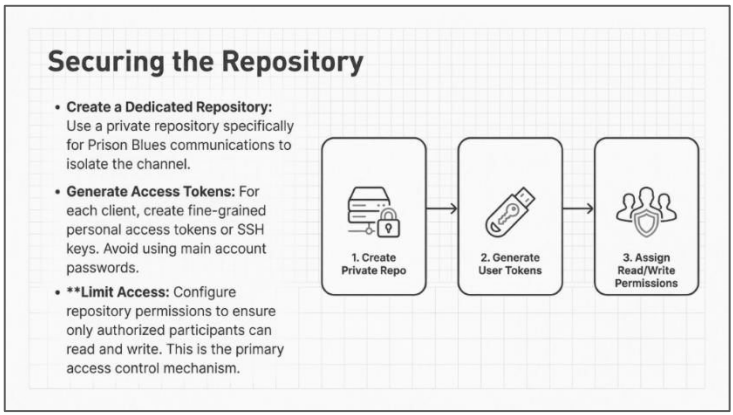


Figure 10: Securing GIT.

Threat Model Considerations:

- *Eavesdropping:* As described, passive eavesdroppers (on network or on the server data) get only encrypted content. The use of robust ciphers (Spot-On supports AES, Serpent, Twofish, Threefish etc. in cascade) and strong public-key algorithms (including post-quantum ones like NTRU, McEliece in Spot-On) means the messages are practically impossible to decipher. GPG encryption if used is similarly strong (and can hide recipient info as noted with throw-keyid option).
- *Man-in-the-middle and Impersonation:* An attacker with write access to the repo could try to impersonate a user by pushing encrypted messages of their own. However, without the signing key or shared secrets of the group, these messages would fail authentication. Spot-On clients would not accept them as valid (or at least not display them as from a known contact). Therefore, even if an attacker gained credentials to push to the repo, the worst damage is spamming the repo with unverifiable blobs (which

recipients would ignore). For added safety, participants can manually verify commit signatures out-of-band if needed (e.g., GPG signed commits or content).

- *Server compromise:* If the Git server is compromised, the attacker could do denial-of-service (delete repo or refuse service) or harvest metadata. They'd learn how many messages (commits) have been made and when, and possibly correlation like if two users push from different IPs (if not masked) around certain times. But content remains encrypted, preserving confidentiality. If the server tampers (like modifies a blob or reorders commits), clients will detect it (bad signature or hash mismatch). A subtle attack could be to selectively **withhold** commits (not show some messages to a certain user). This could cause participants to have inconsistent views of the conversation. Git normally either everyone has the same commits or not; a rogue server could theoretically fail to deliver a commit to Bob while Alice thinks Bob got it. There's not an easy cryptographic fix to that – it's a risk of a central server architecture (censorship attack). Mitigation is by using multiple repository mirrors (hence support for multiple sites) and by perhaps exchanging commit hashes via another channel for consistency checks. But Spot-On does not explicitly mention that level of verification; it likely assumes the Git server is at least honest in availability.

- *Replay and Timestamp attacks:* Each Spot-On message includes timestamps to prevent replay in the P2P context. In Prison Blues, a replay (re-adding an old commit) would either be ignored (already in history) or appear as a duplicate file (which Spot-On could detect by identical content or timestamp). The

commit time is part of metadata, but an attacker could forge an arbitrary commit time (Git allows that in commit objects). However, unless it's signed by the user, it's moot. Timing analysis could theoretically be done by an observer: if Alice and Bob push in quick succession regularly, one might infer a conversation pattern. But this is a general side-channel that is hard to avoid without introducing random delays.

Integration with GPG and Rosetta: The Rosetta CryptoPad is an optional feature for those who want an extra layer of security or who prefer using known PGP tools. Spot-On's Rosetta module allows users to conduct "slow" encrypted exchanges by manually copying ciphertext, etc.. In Prison Blues, Rosetta becomes more powerful: instead of copy-pasting into email or forums, users can send Rosetta-encrypted messages through the Git channel. *The Spot-On manual confirms that "GPG messaging is functional in Rosetta [over Prison Blues]" and that Rosetta can share GPG key bundles via Prison Blues*. This means two users could exchange their GPG public keys or even signed status messages through the repo. When using Rosetta mode, GPG provides end-to-end security independent of Spot-On's native encryption. For example, Alice can write a message in Rosetta pad to Bob, encrypt with Bob's PGP key, and send – Bob will retrieve it from the repo and use his PGP key to decrypt inside Spot-On. The benefits are:

- It leverages the Web-of-Trust or PKI model of GPG, which some users may prefer for verification (e.g., they can verify the signature with a known public key).
- It allows sharing larger items like public key blocks or other data in ASCII-armored form.
- If post-quantum concerns arise, one could even plug in a post-quantum GPG key (if supported by GPG's

backend) and have that added security for the content.

One caveat is that using GPG introduces the need to manage those keys (which Spot-On helps with: it can generate keys, import/export them, and will not keep private keys in its own databases – it uses GPG's keyring). Spot-On ensures that removal of GPG keys in its UI doesn't automatically remove them from your system unless you choose so. This separation keeps the trust and crypto model transparent.

Forward Secrecy and Ephemeral Keys: Spot-On's approach to forward secrecy in asynchronous messaging might involve rotating session keys frequently or using its "Cryptographic Calling" to set up ephemeral shared secrets for a session. However, in an offline medium like Git, they cannot perform an interactive DH exchange easily. Instead, they might rely on pre-shared long-term keys (as exchanged when the friendship was established in Spot-On). Those long-term keys can then encrypt each message with a fresh symmetric key (the hybrid method described in Spot-On's docs). This provides forward secrecy to some extent (if using ephemeral RSA or a NTRU key encapsulation per message). Spot-On's *Instant PFS (IPFS)* for calls is interactive, but for messaging it likely uses timestamped ephemeral key pairs internally. Without diving into source code, we infer that each message isn't just encrypted with a static session key that persists across sessions – it's likely per message or per boot.

Conclusion of Security: Prison Blues effectively layers encryption (Spot-On's and optional GPG) to secure data at rest and in transit. It addresses many threats: eavesdropping, tampering, unauthorized access. The main residual vulnerabilities are *traffic analysis and availability*. Adversaries may discern that a hidden communication is happening by observing repository activity (especially if using a public Git host – commit frequency and size could give clues). They

might not know content but could guess presence of covert comms. Using a dummy or cover repo with other decoy commits could be a strategy to obfuscate this. Availability is a concern – if the repo is taken down, communication halts. To counter that, distributing communications over multiple sites (mirrors) or having a backup channel (Spot-On could fall back to P2P Echo or POPTASTIC if Git fails, though this isn't automatic currently) would enhance resilience.

In the grand scheme, Prison Blues' security stance is strong: it assumes the server and network can be hostile and puts trust in strong cryptography. It extends Spot-On's multi-layered encryption philosophy – even, as we've seen, encouraging *multi-hop forwarding (with the Windows bridge) and multi-application layering (with GPG)* to achieve a **defense-in-depth** approach where each layer (transport, application, payload) provides protection.

Comparison with Other Spot-On Methods

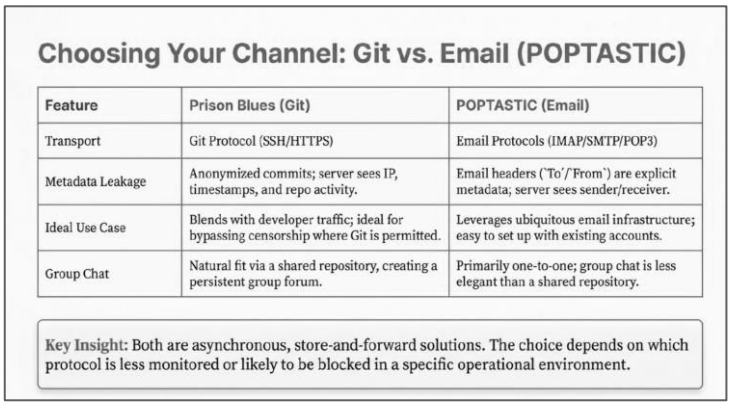
Spot-On is a suite with multiple ways to exchange messages and data. Here we compare Prison Blues to other communication mechanisms in Spot-On, highlighting use cases, performance, and encryption pathways:

Prison Blues vs. POPTASTIC (Email-based Chat)

POPTASTIC is Spot-On's feature for sending messages through conventional email servers (SMTP/POP3/IMAP). Introduced in Spot-On v0.17, it allows near-real-time chatting via email accounts: essentially, Spot-On sends an email (with encrypted content) to your friend's designated email address, and the friend's Spot-On retrieves it via POP/IMAP. This is analogous to how **Delta Chat** established it several years alter based on Spot-On's POPTASTIC – leveraging email infrastructure for messaging. Indeed, some literature

reference Delta Chat's development years later as a derivation from POPTASTIC.

Use Cases: POPTASTIC is useful in scenarios where direct P2P connectivity is not possible but email is accessible (e.g., behind corporate firewalls or on networks where only email ports 465/993/587 etc. are open). It's also friend-to-friend in the sense that you exchange email addresses and an initial key with your contact, and then the communication is E2E encrypted over email hops. Because it relies on store-and-forward (email boxes), it, like Prison Blues, enables asynchronous messaging (the recipient doesn't need to be online at the same time; they'll get the message on next email check).



Choosing Your Channel: Git vs. Email (POPTASTIC)

Feature	Prison Blues (Git)	POPTASTIC (Email)
Transport	Git Protocol (SSH/HTTPS)	Email Protocols (IMAP/SMTP/POP3)
Metadata Leakage	Anonymized commits; server sees IP, timestamps, and repo activity.	Email headers ('To'/'From') are explicit metadata; server sees sender/receiver.
Ideal Use Case	Blends with developer traffic; ideal for bypassing censorship where Git is permitted.	Leverages ubiquitous email infrastructure; easy to set up with existing accounts.
Group Chat	Natural fit via a shared repository, creating a persistent group forum.	Primarily one-to-one; group chat is less elegant than a shared repository.

Key Insight: Both are asynchronous, store-and-forward solutions. The choice depends on which protocol is less monitored or likely to be blocked in a specific operational environment.

Figure 11: Encrypted Chat over Prison Blues (GIT) vs. POPTASTIC (E-Mail).

Latency & Delivery: POPTASTIC can achieve near real-time messaging if both clients poll their mailboxes frequently (Spot-On can maintain an IMAP idle or frequent POP check). But it can have more latency than a direct socket if the email provider or network introduces delays. Prison Blues is similarly asynchronous, but performance might differ: Git push/pull can be quite fast (especially if using a low-latency Git server), but if clients only poll every minute or so, that

adds delay. In practice, both can be configured for reasonable responsiveness, though neither is as instantaneous as a direct connection.

Encryption and Security: Both POPTASTIC and Prison Blues deliver Spot-On's encrypted payloads over a third-party server. In POPTASTIC, the emails' bodies are encrypted (and possibly base64 or armored), so an email provider like Gmail only sees gibberish. However, email adds metadata concerns: the "From/To" headers, subject lines (Spot-On likely leaves subject blank or benign), and the mere fact of an email between two addresses can be observed by the provider or adversaries. By contrast, Prison Blues hides communication inside a repository on (say) GitHub or a private server – an observer sees commits but perhaps does not immediately correlate them to person-to-person talk. Email servers also typically store emails for some time, which could be a risk if accounts are compromised. Git commits are stored too, but you can self-host a Git to reduce third-party exposure. Another security difference: *POPTASTIC does not support Spot-On's two-way calling (no real-time call setup), which is similar to Prison Blues dropping calls. Both are meant for messaging, not live sessions.*

Similarity to Delta Chat: Delta Chat is an open-source messenger that uses email as a backend but gives an IM-like interface. POPTASTIC in Spot-On is conceptually the same and Delta's architectural design model – you could use any standard email account and Spot-On takes care of encryption and retrieval. Spot-On even provides integration to generate or handle keys for email use. The **advantage of POPTASTIC** is that it can piggyback on the huge email infrastructure and even work over email-to-SMS gateways etc., broadening reach. The **advantage of Prison Blues** is that software development and ops environments might allow Git where email is monitored or filtered; also, group conversations in one Git repo are easier than in email (where

group threads can be messy). POPTASTIC messages are one-to-one (though one could conceivably do CC: multiple recipients, it's not typical in Spot-On usage).

When to use which: If users already have safe email accounts and want minimal setup, POPTASTIC is quick to configure (just provide mail server creds) – it's even been described as "P2P Email without data retention". If, on the other hand, setting up a repo is feasible and one wants to avoid email providers (or enjoys the idea of camouflaging messages as code commits), then Prison Blues is a novel alternative. Some might even use both piggyback ideas for encrypted chat: POPTASTIC for interactive chat and Prison Blues for more covert or archival communication. Both deliver messages into Spot-On's unified interface (friends show up regardless of transport).

Prison Blues vs. Rosetta CryptoPad

Rosetta CryptoPad is a tool within Spot-On for manual encryption/decryption of text – essentially an offline cipher pad. The user enters plaintext into the pad, selects a friend's key, and hits "Encrypt" to get ciphertext, which they can then copy and send via any medium (or decrypt text from a friend). It's named after the Rosetta Stone, implying translation of plaintext to cipher and back. Rosetta is independent of networking; it's meant for "slow chat" via manual copy-paste into email, forum posts, or any channel the user chooses. It uses asymmetric encryption (each friend pair has a Rosetta key, separate from chat key).

Integration with Prison Blues: Prison Blues gives Rosetta a dedicated delivery channel. Instead of copying output to some external channel, a user can send it through the Git repo as a Rosetta message. Spot-On's interface likely allows sending a GPG-encrypted Rosetta message just like a normal message, but it appears in the Rosetta tab on the other side.

The manual confirms various Rosetta operations work with Prison Blues: *GPG attachments, key bundle sharing, GPG messaging, status messages all are supported via Rosetta/Prison Blues*. Essentially, Rosetta over Prison Blues is like using PGP email, but on a Git platform.

Use Cases: Rosetta is ideal when you want **complete control and transparency of the encryption process**. It appeals to power users who might want to double-encrypt something or who don't trust automation. For example, you might pre-encrypt a message with your own PGP tool and then send it (Spot-On won't double-encrypt if you use the Rosetta method – it will recognize it as already-encrypted payload meant for the other's Rosetta). Also, Rosetta allows "air-gapped" or offline practice: one could prepare messages offline, carry them on USB, and drop them on a repository or other channel later. It's akin to using Spot-On as a **TEE (Trusted Execution Environment)** for manual encryption – not in the hardware sense, but in the operational sense that you're doing encryption offline and only transferring ciphertext.

Comparison: The difference between sending a normal Prison Blues chat message and a Rosetta message is in **flexibility vs convenience**. Normal messages are automatically encrypted with keys exchanged in Spot-On and decrypted on the fly – it's seamless. Rosetta requires you to explicitly choose to encrypt something (perhaps even type it in a separate pad) and is typically more cumbersome (Spot-On calls it "slow chat" for a reason). However, Rosetta can do things like attach your friend's public key to the message or use different algorithms (maybe one friend could insist on using RSA-4096 via GPG for paranoia, even if the rest of Spot-On is using NTRU). Rosetta also shows the user the ciphertext if they want, giving a sense of confidence what is being sent. It's essentially **manual PGP** inside Spot-On.

Many users may not need Rosetta when using Prison Blues, because the whole point of Prison Blues is to automate encryption over Git. But it's a powerful option for those who do. One real-world scenario: If two people do not trust any live network for initial key exchange, they could use Rosetta to exchange public keys or secrets via a public pastebin (for example). Once they've done that out-of-band, they can shift to normal Spot-On messaging.

In summary, Rosetta vs Prison Blues is not either-or; Rosetta is a mode of operation and Prison Blues is a transport. They combine to provide something akin to encrypted email but on Git. A technical user might view Rosetta as analogous to using GPG manually, whereas normal Prison Blues chat is like using OTR/Signal automatically. Security-wise, Rosetta is as strong as PGP (which is very strong, albeit without forward secrecy unless you refresh keys). Spot-On's native encryption might offer more forward secrecy, but either can be configured for robust cryptography.

Prison Blues vs. Human Proxies (Inner-Envelope Routing)

Human Proxies in Spot-On (also called the *inner-envelope problem*) is a unique feature implemented in the Spot-On chat to enhance anonymity and reach in the F2F network. It allows one friend to act as a proxy to deliver a message to another friend. For example, if Alice is friends with Bob and Bob with Charlie (but Alice not directly with Charlie), Alice could send a message to Charlie through Bob without Bob learning that fact. The message is double-encrypted: one layer to Bob (so Bob sees a message addressed to him, but can't read the inner content), and inside is a message for Charlie encrypted to Charlie's key. Bob's Spot-On, upon receiving, notices the inner envelope meant for Charlie (due to a special flag) and forwards it along to all its neighbors (of

which Charlie is one). Charlie then receives the inner message and can decrypt it. The result: Charlie gets a message from Alice but doesn't know it came via Bob; Bob doesn't know what it was or that it was for Charlie. This provides plausible deniability and hides the A–C relationship even if an adversary is analyzing the network.

Contrast with Prison Blues: Human proxies require an active multi-hop network and dynamic routing, which are absent in Prison Blues. Prison Blues relies on a fixed server and does not support the inner-envelope mechanism – all messages are effectively direct (even though through server). There is no concept of friend relaying in Git; everyone has equal access to the repo. If anonymity of social graph is a concern, human proxies are brilliant in the P2P context because they confound an observer as to who is really communicating with whom. In Prison Blues, if an adversary got access to the repository, they see that *someone* (all under the user "prisoner") is posting messages that others are reading, but if the adversary also monitors the endpoints (like network logs to see who pulls when), they might correlate that these two IPs are pulling/pushing to the same repo and thus infer those two are chatting. Human proxies in echo would route messages through intermediate nodes, potentially obscuring this link.

However, Prison Blues could achieve something somewhat analogous to human proxies if participants set up a chain of Git servers or a replication scheme – but this would be complicated and is not provided out-of-box. In effect, *the role of Bob as a forwarder in human proxy is replaced by the Git server in Prison Blues*. But the Git server knows it's forwarding from A to B. In human proxy, Bob doesn't fully know that.

Use Cases: Human proxies are useful when direct connections are risky or impossible and one trusts an intermediary friend to carry traffic (but not to read it). For

example, in a network where A and C can't connect due to topology or want extra anonymity, they enlist B. Prison Blues, on the other hand, is useful when no live friend nodes are available or trustworthy, so you use an inert server. With human proxies, you need friendly peers online; with Prison Blues you just need the server up.

Encryption Pathways: Human proxy messages have two layers: encrypted A→C inside, and outer envelope A→B (which is just a normal encryption to B). Prison Blues messages typically have one layer (A→B encrypted). If one wanted to emulate an inner envelope in Prison Blues, one could manually double-encrypt a message (like encrypt to C's key, then to B's key) and commit it. But Spot-On has no reason to do that in Git mode because B is not needed as a router in Git. Instead, if offline routing was needed, one could just share the repo link with B, but then B would see the content unless it's not intended for them.

In summary, **human proxies vs Prison Blues** come down to *dynamic F2F routing vs static server storage*. They serve different niches: human proxies shine in strengthening anonymity in a connected friend web; Prison Blues shines in bypassing the need for a continuous friend web by using an external store. They are not directly comparable but are alternative solutions to the problem of "how do I reach someone when direct comms aren't straightforward." Human proxies require trust in the network of friends (though not exposing actual content), whereas Prison Blues requires trust in a repository host (though not exposing content either, just metadata).

Prison Blues vs. StarBeam (Encrypted File-Sharing)

StarBeam is Spot-On's file-sharing mechanism, which uses magnet links and the Echo network to share files in a decentralized manner. Essentially, when you send a file to a friend (or a group), Spot-On creates a torrent-like magnet URI and even spins up an embedded tracker within Spot-On. The magnet link is sent over the chat, and then the file is transferred P2P through the multi-hop network (all encrypted) possibly swarming if multiple recipients are downloading. All file transfers are end-to-end encrypted, and Spot-On even offers an *additional file encryption called Nova*: before sending, it can ask you for a password to AES-encrypt the file, adding another layer (the recipient must enter the same password to decrypt after download). This Nova layer is optional but provides confidentiality even if someone somehow intercepted the file data.

Use Cases: StarBeam is ideal for large files or bulk data distribution among friends. If you have many participants (like group share), it uses torrent swarming so that multiple seeds/peers can help distribute the file – a very efficient approach. It's built for the scenario of sharing videos, documents, etc., within the Spot-On network, benefiting from multi-hop to avoid direct connections.

Prison Blues, by contrast, is not optimized for large file transfer. While you *can* send files through Prison Blues (e.g., as GPG attachments in Rosetta or perhaps by Base64 encoding and chunking), that would bloat the Git repository significantly. Every file would be stored as a commit object (which duplicates content across history if not handled). Also, Git has file size limits on many hosted platforms (often 100 MB per file on GitHub, for instance). So, **Prison Blues is**

better suited for smaller payloads – text messages, small attachments, key files, maybe images or short documents.

Encryption Differences: In StarBeam, the encryption is integrated: the file is broken into chunks and sent over the echo network encrypted with the same keys as chat (plus the optional Nova password encryption on top). It's effectively an end-to-end encrypted torrent. In Prison Blues, if you did send a file, it would likely be encrypted with GPG (if using Rosetta attachments) or possibly just as an encoded blob via the normal message encryption. But Git is not great for streaming; you'd have to wait for the whole file to be pushed, and others to pull it. No swarming: only the original uploader seeds it. If multiple people need it, they all pull from server rather than from each other, which is less efficient.

Parallel vs Asynchronous: StarBeam transfers start instantly when the magnet link is received and can leverage parallelism (similar to BitTorrent multi-source). Prison Blues transfers are asynchronous and single-source. If the Git server is slow or distant, downloads are slow. Also, merging large binary commits can be painful if two people try to upload different files at once (Git can handle it, repo grows).

Figure 12: Comparison of Encrypted Protocols.

Censorship & Stealth: One reason one might consider Prison Blues for file sharing is stealth – perhaps an adversary monitors typical file-sharing ports but not Git. However, pushing a large file through Git might still raise eyebrows (and it's not very covert if the repo suddenly gets a 50MB commit). StarBeam's traffic looks like random data over Spot-On's custom protocols; Prison Blues file traffic looks like… potentially large Git pack files being uploaded, which could stand out if your environment doesn't normally use Git for big binaries.

Conclusion: StarBeam is the go-to for file sharing in Spot-On – it's faster and more suited to the task. Prison Blues can handle **lightweight file drops** (for example, a small text file or a key bundle or a document). One interesting use of Prison Blues could be **state-proof anchoring** – because Git logs commits immutably, one could embed a hash or a small file in the repo as a form of timestamped proof (e.g., "we agreed on this text – see commit hash"). This is something not offered by StarBeam (which doesn't have a public ledger). In fact, the user's question hints at "state-proof file/message anchoring in Git logs" as a use case. This means using the Git commit history as evidence of something (like a poor man's blockchain). For instance, two parties could agree on a contract text, then one commits its hash to the Prison Blues repo. Later, that commit can serve as a **timed, signed record** of the agreement. In that sense, the Git-backed nature of Prison Blues offers a unique feature: auditability and permanence, which StarBeam (being more ephemeral) doesn't.

So, in summary, **Prison Blues vs StarBeam**: StarBeam for efficient, real-time file transfers and sharing; Prison Blues for smaller or more covert file exchanges and for exploiting the Git ledger for proof-of-data. Both are end-to-end encrypted. StarBeam uses multi-hop networking (harder to censor but perhaps more noticeable if network monitors catch unusual

encrypted traffic patterns), whereas Prison Blues uses a standard protocol (Git/HTTPS) that might blend in but relies on a central point.

Real-World Use Cases

Prison Blues opens up several compelling use cases for secure communication:

- **Secure Asynchronous Messaging:** In environments where correspondents are rarely online simultaneously (or deliberately avoid simultaneous presence for security), Prison Blues shines. For example, a journalist and a source could share a private Git repo. The source pushes an encrypted message at noon; the journalist, who comes online later, pulls it in the evening. Even if days apart, the message gets delivered without needing a server that stores emails (and without subject lines or email metadata). The history in Git acts like a covert message log. Unlike email, there's no easy way for outsiders scanning content to even know it's a message – it could appear as random data or code in a repository.
- **Offline Message Drops:** Prison Blues can be used as a modern "dead drop". Imagine an activist under surveillance who has internet only at a library. They could push a message to a Git server and then leave; the partner pulls it from another location hours later. Because the content is encrypted and stored, neither has to be continuously connected. This drop could even be done partially offline: for example, one could put the Git repo on a USB stick and physically pass it after doing local commits (though that's a bit contrived since it's easier to just pass a note – but

Git's versioning gives assurance that it wasn't altered).

- **Censorship Evasion:** Using Git as a carrier can help circumvent censorship. Many regimes tightly monitor or block messaging services, but they may allow Git traffic (especially to major platforms like GitHub) since it's used by developers and companies. With Prison Blues, dissidents could communicate through a repository on a platform that the censor is reluctant to block (e.g., GitHub is often globally accessible because blocking it can have large economic fallout). Their communication would look like repository updates. As an example, the Spot-On radar paper notes that Spot-On's sub-project can export web content to GitHub repos to bypass Great Firewall reading restrictions. Similarly, passing messages via GitHub can avoid common chat surveillance. Even if the repo is discovered, the content is opaque due to encryption. We might call this "steganography via Git commits" – not hiding the existence of data but hiding its purpose in plain sight among code. If needed, users can even pad or format their encrypted messages to look like source code (though that's not default).

- **State-Proof Anchoring:** As mentioned, every commit in Git has a timestamp and cryptographic hash linking it. Participants can leverage this for **proof-of-existence** of data. For instance, two parties finalize a contract or a statement; one commits its hash to the repo. Later, if either party disputes it, the presence of that hash in the repository's history (with a date) is evidence that the data existed at that time and was acknowledged by being in the shared repo. This could be used for things like **tamper-evident record keeping** (each message is essentially

logged). Unlike a blockchain, Git isn't decentralized among many authorities, but if the repo is shared by multiple mutually distrusting parties, it's somewhat tamper-resistant (any change in history would alert others syncing the repo). It's a niche use case, but valuable: for example, a group of activists might log important event details or files in the repo, knowing that even if they get arrested later, the commit history can prove what they knew and when, or can prove if someone tries to backdate changes.

- **Multi-Party "Forum" or Channel:** Prison Blues can function as an encrypted forum or newsgroup. If you have a community of say 10 people, you give them all access to a private Git repo. This becomes an asynchronous group chat: anyone can post a message (commit) and everyone else will get it on the next pull. It's like an email list or forum board but encrypted and hosted in a single repo. Use cases include small teams who want a record of discussions (the Git log), or groups in high-surveillance industries who prefer not to use unecrypted messengers or Email. It's not real-time, but for many discussions (especially technical or operational ones), a delay of seconds to minutes is fine.

- **Federated Communication Across Enclaves:** Consider a scenario with multiple secure enclaves or cells (e.g., separate networks or organizations) that need to share select information securely. Each enclave might run its own Spot-On echo network internally for real-time comms, but they agree on using a central Git repo as a *bridge* for inter-enclave messages. Because Git is easily scriptable, one enclave's server could pull messages from the central repo and then redistribute internally via Spot-

On Echo to members of that enclave. Meanwhile, another enclave does the same. In this way, the Git repo acts as a federation point where encrypted data is exchanged between otherwise disconnected secure cells. This is somewhat theoretical but could apply to, say, different branches of an NGO coordinating – each branch has a relay that syncs from the global repo, distributing messages to local members. This yields a *federated friend-to-friend model via a hub*, with the hub not trusted for content.

- **High-Surveillance Environment Team Coordination:** In a corporate or government setting where IT monitors all communications, two colleagues could use a Git repo on an internal server to chat without raising flags. It would appear as if they are collaborating on code or documents. With careful planning (using code-like commit messages perhaps), it just blends into normal work. The encryption ensures that even if IT inspects the repo's contents, they see only gibberish or "random" data in files that might pass as binary blobs. If confronted, the employees could claim it's some encoded data or proprietary format. This plausible deniability and misdirection can be life-saving under oppressive regimes as well.

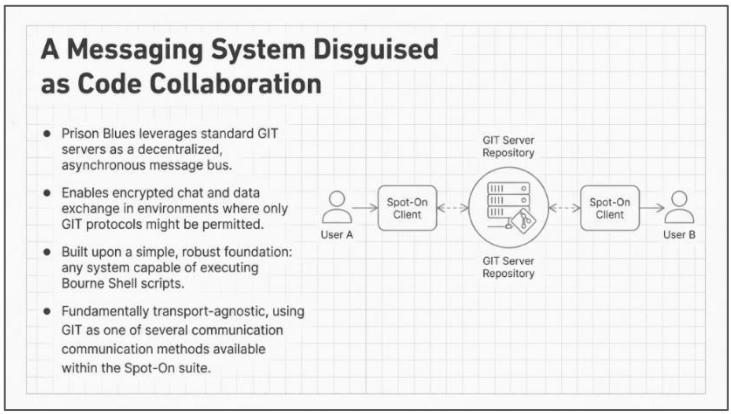


Figure 13: Messaging over GIT Code Collaboration.

In all these cases, it's vital that operational security is maintained: keys are kept secret, the repository access is tightly controlled, and the participants understand not to leak information in commit messages or other side channels. Spot-On's implementation assists by using generic identities and requiring explicit key exchanges, ensuring that if used properly, Prison Blues can serve as a very covert and resilient communication method in practice.

Deployment Scenarios

How can organizations or communities deploy Prison Blues effectively? Here are a few scenarios:

- **Private Community Git Chat:** A small community (say a research group or a privacy-focused club) sets up an invite-only Git repository on a server they control. They distribute Spot-On to all members along with initial keys. This repo becomes their encrypted message board. New joiners are given access and the necessary keys (out-of-band). They might segment discussions by using different subdirectories or file name conventions, but

everything is in one place. All members run Spot-On which periodically syncs the repo. This setup provides a **semi-persistent group chat** that any member can catch up on by pulling the history. It's like a decentralized forum – no single moderator holds all the data unencrypted, and even the server admin cannot read the content. If a member leaves, you revoke their repo access (and possibly rotate keys for forward security going forward). This scenario could be applicable in academic circles sharing sensitive ideas, or activists sharing news among themselves, etc.

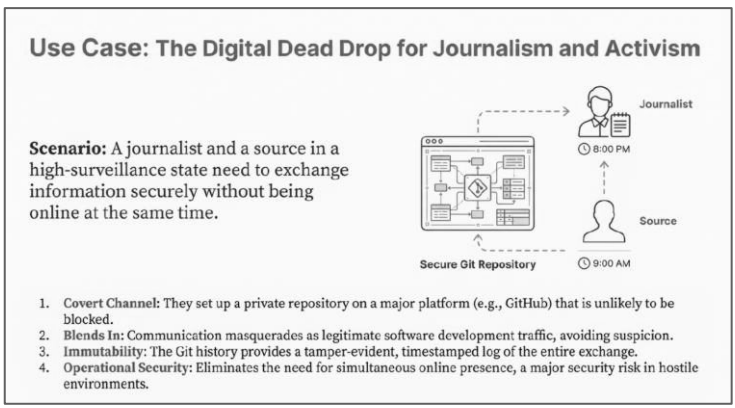


Figure 14: A Digital Deadrop.

- **High-Surveillance Team Coordination (with Unix Relay):** Picture a team of journalists in a country with heavy internet surveillance. They cannot use Signal or Tor openly without suspicion. But they can use a **Unix relay in the cloud plus Prison Blues**. They rent a small Linux VPS outside the country, install Spot-On on it (as a relay with Prison Blues config) and a private Git repo (or use a Git service outside). Each journalist runs Spot-On on their laptops; those who have Windows use the relay method. They all

connect as neighbors to the relay (which also might connect them into a small echo network for real-time when possible). The relay handles the Git messaging to the outside repo. To an observer, the journalists' laptops only ever communicate with the relay (which could be seen as some innocuous server or even hosted on an IP that looks like a company VPN). From the relay outward, the only thing seen is Git traffic to a repository. This repository could even be on GitHub, blending with normal dev traffic. This architecture gives **multi-hop anonymity**: local link encrypted (journalist to relay), then relay to Git via encrypted channel, then same path back down for recipients. Even if the adversary identifies the Git traffic, they can't directly see the end clients. The Unix relay can also store a local copy of messages in case internet is down, delivering them internally when possible (half-online scenarios).

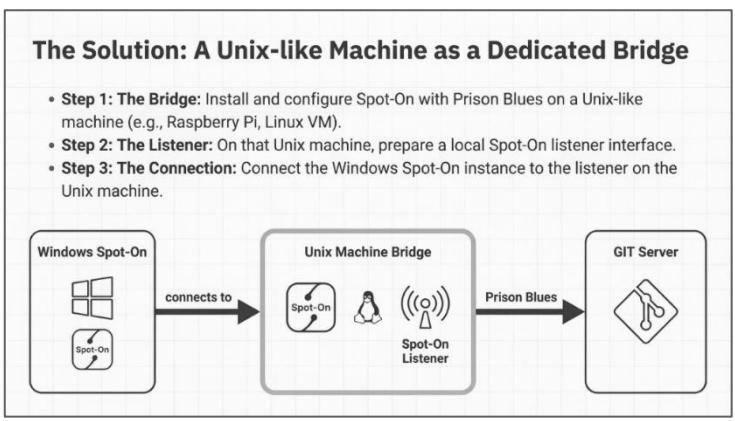


Figure 15: Unix is the Solution.

- **Federated Secure Enclaves:** Extending the earlier idea, imagine multiple regional offices of an organization, each with their own Spot-On network

(like each runs a Spot-On kernel for internal chat). They want to share some info globally but without opening direct connections (maybe networks are isolated for security). They can use a **central Git hub** as a drop point. Each region's Spot-On server (or a dedicated client) connects to the hub periodically. When Region A wants to send a memo to others, it encrypts it (maybe one message addressed generally or individually) and pushes to the hub. Region B's client pulls it and then redistributes within Region B's Spot-On network (perhaps via group chat internally). This is a bit complex to set up, but it's a way of having a *federated model:* the Git hub links the regions without requiring them to be on the same live network. It also could be done hierarchically – e.g. a tree of Git relays. This scenario might be relevant for highly compartmentalized organizations (intelligence, military) that still need to share intel securely across units.

- **Secure Broadcast Channel:** Another scenario: one-to-many broadcast. Suppose a leader of a dissident group wants to periodically broadcast messages to supporters, but without using something obvious like Twitter. They could use a public Git repo as a bulletin board. The leader (or a small trusted circle) has push access; all supporters have read access (pull only). The supporters run Spot-On or even just a script to pull the repo and decrypt messages (they'd need the key of course). This way, the leader can't see who reads the messages (since it's just a pull, which could be anonymous if the repo is public or accessed via Tor), and the supporters remain hidden. The messages are still encrypted (maybe a group key shared to supporters clandestinely). If an adversary finds the repo, they see encrypted posts but can't

decipher them. This *broadcast via encrypted Git* is like an underground newsletter or dead drop that many can read but only the author can write. It is one way to achieve a **one-way communication** safely (useful for leaks, announcements, etc., where you don't want interaction, just distribution). Traditional methods might use a blog with PGP-encrypted text – using Git is more niche but has the advantage that the content can't be easily flagged by keyword (since it's not plaintext anywhere).

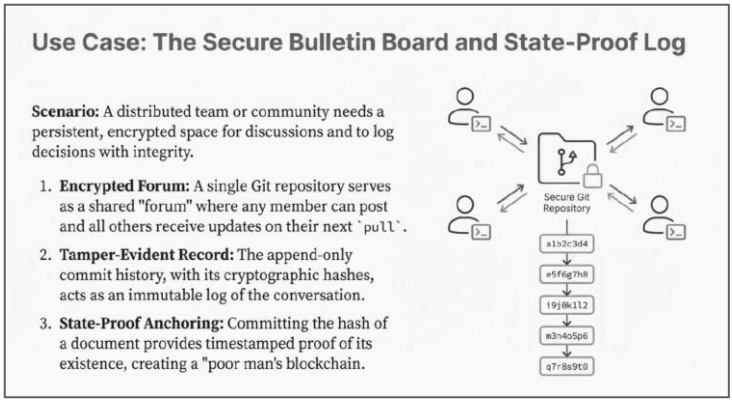


Figure 16: A Secure Bulletin Board Chat.

- **Integration with CI/CD or Automation:** An offbeat scenario: because the messages are in a Git repo, you could integrate with other systems. For example, a script could monitor the repo and take action on certain messages. This crosses into steganography or command-and-control territory. One could use Prison Blues to send encrypted commands to a server (the server pulls repo and executes instructions found in commits). This would be a very covert C2 channel since it's just Git traffic. Obviously this is dual-use – could be used maliciously as malware control, or legitimately as a way to trigger

events across systems in a secure way. Spot-On itself doesn't provide that integration, but a user could build on it.

In planning deployments, a few **practical considerations**: Each client needs the Spot-On software (which is cross-platform enough). Setup of keys and repo must be done carefully (initial key exchange is the hardest part in any E2E system – likely done via Spot-On's conventional methods like exchanging public keys via USB or using its SMP password verification in person). Time synchronization is important; Spot-On notes that clocks should be correct for things to work well (timestamps, etc.). Also, all participants need at least basic Git familiarity if something goes wrong (e.g., if a commit is stuck or there's a conflict push – though if each message is an independent file, conflicts are rare). There might also be a need for repository maintenance (pruning old messages if desired, adding new members by sharing credentials).

Overall, deployment scenarios show that Prison Blues is very flexible – it's not just a one-on-one chat tool, it can morph into a group forum, a bulletin board, or a bridge. The key is that all these scenarios leverage Git's strength (distribution and persistence) and Spot-On's strength (encryption and decentralization) to achieve secure comms in situations that typical real-time messengers can't handle.

Limitations and Challenges

While Prison Blues is powerful, it comes with its own set of limitations and operational challenges:

- **Latency and Sync Delays:** As emphasized, Prison Blues is inherently asynchronous. If a near-instant conversation is needed, this isn't the ideal channel. There will always be some delay introduced by commit/push and fetch intervals. If users set very

frequent fetch intervals (or manually trigger pulls often), they can reduce latency, but at the cost of more server load and possibly more conspicuous traffic. In low bandwidth or high-latency networks, the delay could be some seconds. Users must adapt to a communication cadence more like email than instant chat for Prison Blues. But POPTASTIC and Delta Chat are the models that show, that encrypted chat over these servers work also.

- **Repository Conflicts & Scaling:** Git is designed to handle concurrent edits through merges, but in a messaging scenario, we typically append new files rather than editing the same file. If by design each message is a new file, conflicts (two people pushing at the exact same time modifying the same file) should be very rare. However, if it does happen – say two users coincidentally create a file with the same name or push at the same second – one push will be rejected by the server until the user pulls the other's commit and merges. Spot-On's automation might handle this by auto-merging or renaming one of the files. But if not handled, it could confuse non-technical users. In a multi-party group with frequent messaging, the repo could see rapid commit accumulation. Git can handle thousands of commits, but client performance might degrade if every pull has to process many small files/commits. Also, history never shrinks unless you prune – so a years-long use could make the repository quite large (especially if attachments are included). This leads to more bandwidth and storage usage over time.

- **Human Error in Git Management:** Users not familiar with Git might accidentally mess up the working copy (e.g., by manually editing or deleting files in the repo folder outside Spot-On). Spot-On likely expects to be

the only one modifying that directory. If a user does git operations outside of Spot-On or if they inadvertently commit something wrong, it could break the expected format. There's a risk of someone pushing an unencrypted file by mistake (though Spot-On tries to prevent that by managing the process). Another example: revoking someone's access requires removing their Git credentials; if not done promptly when needed, a departing member could still read messages until removed. Unlike a centralized app where you click "remove user" and they're gone, here you must remove their Git access and possibly their crypto keys.

- **Compatibility and Platform Issues:** The reliance on a Unix shell means that on Windows without a relay, it's basically not usable (unless one installs something like Cygwin or WSL just for this, which is extra overhead). Even with the relay solution, that's extra setup. Mobile devices are another issue – Spot-On's mobile client (Smoke) at least as of early versions did not support Git messaging (Smoke was more tied to the Echo or POPTASTIC). So, Prison Blues might be desktop-only at the moment. That limits its use for quick on-the-go chats. Additionally, corporate environments might block Git protocols or require proxies – Spot-On would need to support using HTTP proxies if in such network (not sure if it does). Also, Git large file storage (LFS) is not really applicable to this scenario but if someone mistakenly enabled it, it could complicate things.
- **Server Dependency (Single Point of Failure):** Unlike Spot-On's pure P2P Echo, which has no central server (friends relay for each other), Prison Blues usually relies on one repository service. If that service goes down or is blocked, communications halt. Even

though encryption mitigates a server compromise reading data, it doesn't mitigate downtime or deliberate blocking. As mentioned, one solution is multi-site support (which Spot-On added) – but coordinating multiple remotes can be tricky (you'd need to push to all and pull from all; Spot-On probably handles multiple sites by doing that in sequence). If one site goes down, you rely on others. Still, it adds complexity compared to "mesh" networks which route around failures automatically.

- **Metadata Leaks:** One of Prison Blues' Achilles' heels is metadata. While actual message content remains secure, commit metadata and network patterns can give away information:
    - **Timing correlation:** If an adversary monitors the Git server or network and sees that whenever person A pushes, shortly after person B pulls, and then B pushes a response, it's clear A and B are chatting. They can't read it, but they know who's talking and when/how much. In an extreme threat model (like a spy scenario), that itself can be dangerous. Using techniques like random delays, dummy commits, or having more people in the repo to obfuscate patterns can help, but Spot-On doesn't implement traffic padding by default.
    - **Repository access logs:** If using a service like GitHub, an insider or gov request might get access logs showing IP addresses of who accessed the repo and when. Even if accounts are pseudonymous, IPs might link to individuals.

- **Commit author identity:** We set a generic name to not leak personal data. But if someone accidentally mis-configures Git and uses their real name/email in a commit, that would burn anonymity. So careful setup is a must.
- **Repo names or URLs:** If you use a very conspicuous repository name (like RevolutionChat), that might draw attention. Better to name it something boring or work-related. This is a human factor issue.
- **File sizes and content patterns:** Encrypted data ideally looks random. If using GPG encryption, it's usually binary or ASCII armor which can be recognizable. Plain Spot-On encryption might look binary. If an adversary sees that all commits in an ostensibly text repo are just blocks of seemingly random data, they might suspect encryption. One could hide in plain sight by mixing some real code or data in the repo, but that complicates use. This is a limitation: perfect steganography is not achieved – it's more protocol steganography (hiding as Git) than content steganography.

- **Usability Challenges:** From a user perspective, this method is more complex than standard messaging. Setting up keys, tokens, and possibly dealing with occasional sync issues may be too high a barrier for non-technical users. Spot-On itself is a suite with many options. There's a learning curve. Additionally, reading messages out-of-order can happen (if two messages are committed quickly, the fetch might get them in swapped order or the timestamps might

confuse sequence – Spot-On says "messages will arrive in some order" and not strictly by time). This non-orderliness is usually minor but can cause confusion in conversation threading.

- **Legal and Policy Issues:** Using covert communication channels can raise suspicion or violate policies. In some corporate contexts, using an unsanctioned private repo for messaging could break IT rules or even laws (if it's seen as data exfiltration). In oppressive regimes, if discovered, participants could face penalties even if content wasn't known. So operational security includes hiding the fact that Prison Blues is being used (perhaps using it sparingly or tunneling it through VPNs). The nature of Git commits might also leave forensic traces on one's device – e.g., the .git directory with commit objects. If an adversary raids your machine and finds an unencrypted working copy or remnants in swap, that's an issue. One should use disk encryption and possibly cleanup local repos if extremely paranoid (Spot-On's purge after processing might help keep the working directory clean).

Despite these challenges, many can be mitigated with good practices and configuration: e.g., use Tor or VPN to connect to the Git server (to mask IP), incorporate dummy traffic or commit batching to reduce timing leaks, regularly prune or move to new repos to limit metadata accumulation, and educate users on proper key handling.

Another limitation to mention is **lack of mobile-friendly access**. If you want to quickly check messages on your phone, you can't easily (unless you have a specialized client or do a manual git pull and decrypt outside Spot-On). Smoke (the mobile client) may integrate this in future, but as of the data available, Spot-On-Lite might address that (the notes

say “Spot-On-Lite will address Prison Blues and Smoke”, hinting at future improvements, possibly a lighter client that can run on mobile or easier on Windows).

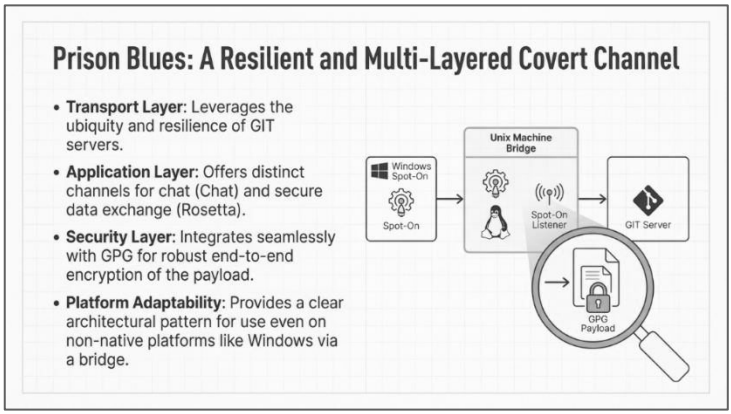


Figure 17: Layers for resilient Encryption.

In summary, Prison Blues requires a bit of technical finesse to use effectively. The limitations revolve around its asynchronous nature, reliance on a central repo, and the subtleties of hiding metadata. With careful handling, these are manageable, but they underscore that Prison Blues is best suited for scenarios that specifically need its unique approach, rather than a universal solution for all messaging needs.

Conclusion

Prison Blues exemplifies the creativity possible in secure communications – repurposing a developer tool (Git) into a covert messaging platform. It adds a resilient, asynchronous channel to the Spot-On encryption suite, expanding the possibilities for users under restrictive or surveilled conditions. **By layering cryptography (Spot-On’s own and optionally GPG) over an unlikely transport, it achieves a form of security-through-obscurity without relying on**

obscurity alone – the strength still comes from encryption, but the choice of transport helps avoid attention.

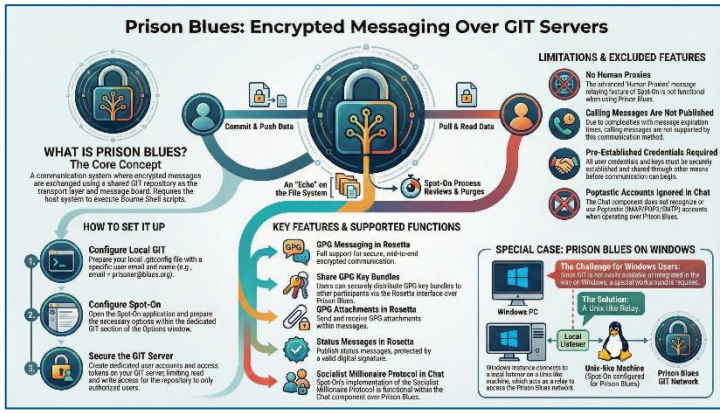


Figure 18: Prison Blues Secure Messaging.

Looking ahead, Git-based messaging like Prison Blues could play a role in **post-quantum and distributed networking scenarios**. Spot-On is already ahead by including post-quantum algorithms (NTRU, McEliece) for its key exchanges. As quantum computing threatens classical encryption, Spot-On users could switch to those algorithms, and Prison Blues messages would then be encrypted in a PQ-resistant manner (one could also integrate a post-quantum secure GPG key if available). The idea of using widely-deployed infrastructure (like code hosting) for covert communication might become more popular as surveillance increases. We may see more projects using similar approaches – for example, hiding messages in cloud storage syncs, or in blockchain transactions, etc. Git provides an advantage of built-in integrity (hash chaining) which is somewhat analogous to a blockchain, albeit centralized per repo.

In distributed networks, one could imagine a fully decentralized Git-based messenger – using something like IPFS or a distributed Git (there are concepts of P2P git or git

over gossip). Prison Blues in its current form still uses a server, but future iterations or similar projects might remove that, creating a mesh of git repositories that sync via p2p (each node acting as a git peer). This could combine the best of both worlds: the Echo's pure decentralization with Git's history tracking. There are technical challenges to doing that (consistency, conflicts), but not insurmountable.

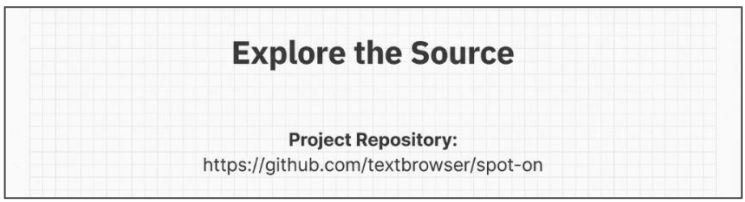


Figure 19: GIT-Repository of Spot-On by Textbrowser.

To wrap up, *Prison Blues is a testament to the principle that any channel can be turned into a secure channel with the right application of cryptography*. It turns the ubiquitous Git into a covert post office for encrypted mail, demonstrating out-of-the-box thinking in the privacy toolset. While it's not a silver bullet – it won't replace real-time chats for most people – it fills a niche for **"when all else is watched, try Git."**

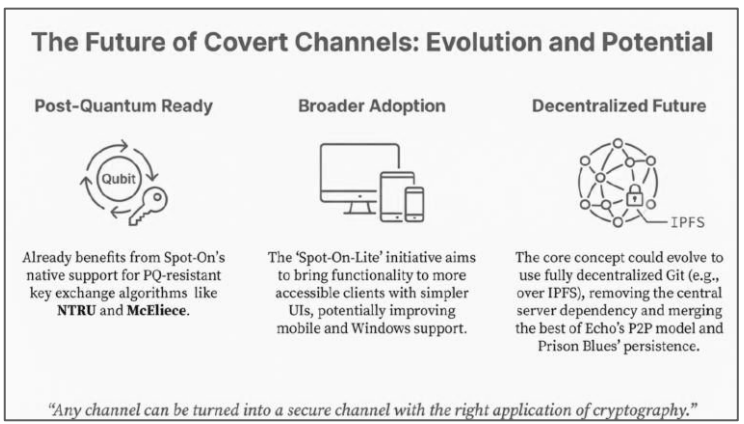


Figure 20: Securing Channels for Chat.

As we move into a future of pervasive surveillance and also the looming future of quantum threats, such multi-layered, multi-hop approaches may become standard in high-security communication. Projects like Spot-On are essentially research vehicles for these ideas, combining old-school cyberpunk creativity with modern cryptographic resilience. In the arsenal of cybersecurity professionals and privacy-conscious users, Prison Blues offers a novel mode to keep communications private and persistent under the most challenging conditions, singing a tune of freedom behind the bars of firewalls and filters.

Appendix

List of Figures