

MODERN GIT BEYOND GITHUB

DESIGN
DEPLOY
SECURE
SCALE

ARCHITECTURES, PLATFORMS AND
OPERATIONS FOR INDEPENDENT
CODE HOSTING



ALTERNATIVE
PLATFORMS AND
SELF-HOSTED
SOLUTIONS



DECENTRALIZED
AND DISTRIBUTED
APPROACHES



SECURITY,
COMPLIANCE AND
GOVERNANCE



CI/CD INTEGRATION
AND AUTOMATION



ENTERPRISE
PRACTICES AND
OPERATIONAL
EXCELLENCE



EMERGING TRENDS
AND THE FUTURE
OF GIT INFRASTRUCTURE

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Modern Git Beyond GitHub

Architectures, Platforms and Operations for Independent Code Hosting

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Contents

Architectures, Platforms and Operations for Independent Code Hosting	1
Chapter 1: The GitHub Monoculture Problem	2
How GitHub Became Default	2
Risks of Platform Lock-in	3
The Regulatory and Geopolitical Dimension	4
What “Beyond GitHub” Actually Means	5
A Framework for This Book	6
Chapter 2: Git Fundamentals for Infrastructure Engineers	8
The Distributed Model and Its Implications	8
Objects, References, and Pack Files	9
Remote Communication Protocols	11
Hooks, Attributes, and Configuration Layers	13
Git Internals That Affect Server Design	15
Chapter 3: The Architecture of a Git Hosting Platform	18
Git Alone vs Git Hosting	18
Core Platform Components	18
The Protocol Stack: SSH, HTTP, and Git Smart Protocols	18
Storage Architectures: Filesystem, Distributed Storage, and Object Stores	18
Authentication, Authorization, and Identity Integration	18
Extensibility: Webhooks, APIs, and Plugins	18
Architectural Styles: Monolith vs Microservices	19
Operational Complexity: The Hidden Cost	19
Chapter 4: GitLab, The Full-Stack Platform	20
History and Philosophy: From a Side Project to Enterprise Platform	20
Architecture: Omnibus, Monolith, and Kubernetes Deployment	20
Feature Set: CI/CD, Registry, Security, and DevOps Features	20

Operational Requirements: Resource Profile and Scaling	20
Licensing: FOSS vs Premium and What That Means	20
When GitLab Is the Right Choice	21
Chapter 5: Gitea and Forgejo, Lightweight and Community-Driven . . .	22
Gitea: Origins and Design Philosophy	22
Architecture: Go, SQLite, and Single-Binary Simplicity	22
The Forgejo Fork: Why It Happened and What Changed	22
Comparison: Gitea vs Forgejo vs GitLab	22
Deployment Patterns for Small Teams and Personal Use	22
Scaling Gitea: Limits and Workarounds	22
When Gitea or Forgejo Is the Right Choice	23
Chapter 6: Bitbucket, Enterprise and Cloud Integration	24
Bitbucket Cloud vs Bitbucket Data Center	24
Architecture and Deployment Models	24
Jira and Atlassian Ecosystem Integration	24
Enterprise Features: Branch Permissions, Code Insights, Audit Logs .	24
Comparison with GitLab and GitHub	24
When Bitbucket Fits	24
Chapter 7: Gerrit, Code Review as a First-Class Citizen	26
What Gerrit Actually Is	26
Architecture: The Review-Centric Model	26
Workflow: Change IDs, Drafts, and Approval Chains	26
Integration with Jenkins, CI Systems, and Other Tools	26
Operational Considerations: Performance and Complexity	26
Gerrit in Practice: Android, Kubernetes, and Other Major Projects .	26
When Gerrit Is the Right Choice	27
Chapter 8: SourceHut, Minimalist Philosophy and Tools	28
SourceHut Philosophy: Tools, Not Platforms	28
The sr.ht Suite: Git, Issues, Mailing Lists, CI	28
Architecture: Python, Mail-Driven Workflows, and Simplicity	28
Extensibility and Automation via Hook Scripts	28
Comparison with Feature-Rich Platforms	28
When SourceHut Makes Sense	28
Chapter 9: Other Notable Solutions and Niche Platforms	30
Codeberg and Community-Run Instances	30

CONTENTS

GitBucket and GitHub-Compatible Alternatives	30
Gogs: The Ancestor of Gitea	30
Phabricator and Arcanist	30
Self-Hosted GitHub Enterprise Server	30
Summary of Niche Platforms	30
Chapter 10: Authentication, Authorization, and Identity	32
Authentication Methods: Password, SSH Keys, OAuth, SAML	32
LDAP, Active Directory, and Enterprise Identity Integration	32
Role-Based Access Control and Fine-Grained Permissions	32
SSH Key Management at Scale	32
Multi-Factor Authentication and Hardening	32
Chapter 11: Repository Governance, Branching Strategies, and Collaboration Models	34
Branching Models: Git Flow, Trunk-Based, GitHub Flow	34
Protecting Branches and Enforcing Policies	34
Code Owners and Review Requirements	34
Monorepos vs Polyrepos: Architectural Trade-Offs	34
Conventional Commits and Structured History	34
Governance Tools and Automation	34
Chapter 12: CI/CD Integration and Automation	36
Webhooks: The Universal Glue	36
Native CI Systems: GitLab CI, GitHub Actions, Gitea Actions	36
External CI: Jenkins, Drone, Cirrus, and Buildkite	36
Pipeline Architecture and Design Patterns	36
Runners, Executors, and Build Infrastructure	36
GitOps: Using Git as the Source of Truth for Infrastructure	36
Chapter 13: Package and Artifact Management	38
Container Registries: GitLab Registry, Harbor, and Alternatives	38
Language-Specific Package Managers	38
Artifact Storage and Retention Policies	38
Integration with CI Pipelines	38
Self-Hosted Registry Architecture	38
Chapter 14: Security and Supply Chain Protection	39
Git-Level Security: Signed Commits, Tags, and Verifications	39
Dependency Scanning and Vulnerability Management	39

Software Bill of Materials and SBOM Generation	39
Secrets Detection and Management	39
Supply Chain Attacks: Lessons from Real Incidents	39
Platform-Level Security Hardening	39
Chapter 15: Decentralized, Federated, and Experimental Models	41
Git's Native Distribution as a Decentralization Primitive	41
Federated Hosting and Cross-Instance Collaboration	41
Are We Ready for Decentralized Code Hosting?	41
Chapter 16: Storage, Performance, and Scalability	42
Git Repository Growth: When Does Size Become a Problem?	42
Storage Options: Local, NFS, Ceph, S3-Compatible	42
Cloning and Fetch Performance	42
Database Scaling for Git Platforms	42
CDN Strategies and Geo-Distributed Hosting	42
Benchmarks and Performance Profiles	42
Chapter 17: High Availability, Backup, and Disaster Recovery	44
Backup Strategies: Bare Clones, Dumps, and Replication	44
Point-in-Time Recovery and Versioning	44
Geo-Redundant and Multi-Region Deployments	44
Disaster Recovery Planning for Git Infrastructure	44
Monitoring and Alerting for Repository Health	44
Chapter 18: Observability, Logging, and Auditing	45
Operational Metrics: What to Measure and Why	45
Log Aggregation and Analysis	45
Audit Logging for Compliance	45
Tracing User Actions Across the Platform	45
Compliance Frameworks: SOC2, ISO 27001, GDPR	45
Security Monitoring and Incident Response	45
Chapter 19: Enterprise Deployment, Compliance, and Air-Gapped En- vironments	47
Air-Gapped and Offline Deployments	47
Multi-Cloud and Hybrid Architectures	47
Compliance and Data Residency Requirements	47
Enterprise Support and SLAs	47
Capacity Planning and TCO Analysis	47

Chapter 20: Migration, Interoperability, and Emerging Trends 48

 Migration Strategies: Tools and Processes 48

 Preserving History, Permissions, and Metadata 48

 Interoperability Between Platforms 48

 Emerging Trends: AI-Assisted Development, Enhanced Collaboration,
 Ecosystem Evolution 48

 Making Your Choice: A Decision Framework 48

 The Future of Code Hosting 48

Conclusion 50

References 51

Architectures, Platforms and Operations for Independent Code Hosting

This book provides a comprehensive, technically rigorous guide to Git-based software development infrastructure beyond GitHub. It covers alternative platforms, self-hosted solutions, decentralized approaches, operational deployment, security, CI/CD integration, enterprise practices and emerging trends. The target audience includes software engineers, platform engineers, DevOps practitioners, technical managers and architects who design or operate Git infrastructure that may be on-premises, in regulated environments, or deliberately independent of centralized providers. The book provides real architectural depth, configuration examples, platform comparisons and production-oriented guidance drawn from current documentation, engineering publications and real-world practices.

Chapter 1: The GitHub Monoculture Problem

The modern software industry has an unexamined dependency. Walk into any engineering organization and ask where the code lives. The answer is almost always the same: GitHub. For most developers, Git and GitHub have become synonymous. The version control system invented to manage the Linux kernel has been mentally replaced with a single commercial platform hosted by one company in one country.

This is not how Git was designed to work, and it does not have to be how it works now.

The dominance of GitHub is impressive by any metric. As of early 2026, GitHub reported over 180 million developers on the platform, with more than 36 million new users joining in 2025 alone [1]. The platform hosts over 630 million repositories, processes nearly a billion commits per year and handles an average of 43.2 million merged pull requests each month [1]. These are staggering numbers that reflect real utility. GitHub has earned its position through a combination of early adoption, excellent developer experience and strategic acquisitions that turned a simple repository hosting service into a full development platform.

The problem is not GitHub as a product. The problem is GitHub as a monoculture.

How GitHub Became Default

GitHub was launched in 2008, at a time when open source development was fragmented across mailing lists, sourceforge-style hosting sites and self-managed Git servers. Its early advantage was straightforward: it made Git easy. The web interface was clean. Forking and pull requests created a frictionless model for collaboration that did not exist elsewhere. When developers switched to GitHub, their friends switched too. The network effect accelerated rapidly.

In 2012 GitHub introduced free private repositories for small teams. This was the moment it transitioned from an open source playground to a serious platform for commercial development. Companies could now use the same tool for public projects and internal work. The barrier to adoption collapsed.

The 2018 acquisition by Microsoft for \$7.5 billion was a shock to the community but ultimately reinforced GitHub's position. Microsoft invested heavily in tooling, integrations and infrastructure. GitHub Actions launched in 2019 and became a formidable CI/CD platform. GitHub Copilot arrived in 2021 and created a new revenue stream while locking users deeper into the ecosystem through AI features trained on GitHub's codebase. The IPO in 2021 valued GitHub at \$19 billion, confirming its financial independence while tying it more closely to Microsoft's enterprise ambitions.

Today GitHub is not just code hosting. It is identity, CI/CD, package registries, security scanning, documentation, discussions and increasingly AI-assisted development. The platform has become sticky in ways that go beyond technical dependency. Teams organize their workflows around GitHub's feature set. Hiring requires familiarity with it. Open source contribution norms are built around its model. Leaving GitHub is not a technical decision; it is a cultural and operational upheaval.

Risks of Platform Lock-in

The centralization of software development on a single platform creates real risks that most organizations do not actively manage. These are not theoretical concerns. They manifest in operational incidents, contractual surprises and strategic constraints.

Consider reliability. In 2024 GitHub logged 119 service incidents, including 26 major outages with an average resolution time of 106 minutes per incident [2]. Between May 2025 and April 2026, monitoring service IncidentHub tracked 257 outages totaling over 112 hours of downtime [3]. These are not trivial disruptions. A major outage can halt development across thousands of organizations simultaneously. In August 2025, an eight-hour outage caused 50 percent error rates on repository downloads and disrupted Actions, APIs and Copilot [4]. During such events, teams that depend entirely on GitHub have no immediate alternative workflow.

More subtle is the cost and feature lock-in. GitHub's pricing model has shifted over the years. Free tiers have been reduced. AI features that many

teams now depend on require paid subscriptions. Advanced security capabilities are behind the enterprise paywall. Organizations find themselves gradually migrating from free accounts to paid tiers not by explicit procurement decisions but through feature creep. When GitHub changes its pricing or terms, existing users have limited negotiating power because the cost of migration is perceived as prohibitively high.

Feature lock-in is even more consequential. Teams build CI/CD pipelines around GitHub Actions workflows. They structure their release processes around GitHub Releases. They rely on GitHub's dependency scanning and secret protection. These integrations are not platform-neutral. Moving to another platform means rebuilding automation, retraining developers and potentially changing workflow patterns. The technical debt of migration grows with every GitHub-native integration added.

The Regulatory and Geopolitical Dimension

GitHub operates under US law. Its servers are in US data centers. Its parent company is Microsoft, a US corporation. This is entirely appropriate for most users and most projects. For some organizations, it is not.

Government contractors, defense organizations, healthcare providers and financial institutions face data residency and sovereignty requirements that make hosting sensitive source code on a US platform problematic. Export control regulations restrict who can access certain repositories. Classification requirements demand air-gapped or isolated environments. Even when the code itself is not classified, the development metadata reveals strategic information about capabilities, roadmaps and vulnerabilities.

This is why organizations like NASA, the Department of Defense and major financial institutions maintain internal Git infrastructure despite the convenience of GitHub. They need control over where their data lives, who can access it and under what legal framework. GitHub Enterprise Server provides some of this capability by allowing self-hosted deployments, but the underlying product remains controlled by a foreign entity. Updates, features and licensing decisions are made in Redmond, not in the organization's headquarters.

The geopolitical dimension extends beyond individual organizations. The concentration of global open source development on a US platform gives that platform's parent country outsized influence over software that runs

the world's infrastructure. A decision to restrict access, enforce sanctions, or comply with a subpoena could have cascading effects across the global software supply chain. This is not currently happening on a large scale, but the structural vulnerability exists. Organizations that build critical systems should recognize this and plan accordingly.

What “Beyond GitHub” Actually Means

The phrase “beyond GitHub” carries emotional weight. For some it is a political statement about resisting Big Tech. For others it is a practical engineering decision about reducing single points of failure. This book takes the practical view.

“Beyond GitHub” does not mean abandoning all collaboration with the broader developer community hosted on GitHub. It does not mean every organization must run its own Git infrastructure from scratch. It means recognizing that alternatives exist and understanding them well enough to make informed decisions.

The “beyond” space includes several distinct categories of solutions:

Self-hosted GitLab instances provide the closest full-platform alternative. GitLab offers integrated CI/CD, package registries, security scanning, project management and more. Teams moving from GitHub Enterprise can often migrate to self-hosted GitLab with minimal disruption to workflows while gaining control over infrastructure and data.

Lightweight forges like Gitea and Forgejo offer Git hosting with issues, pull requests and basic CI/CD on a fraction of the resources that GitLab requires. These are ideal for small teams, individual developers, or organizations that want Git hosting without the full DevOps platform. They can run on a Raspberry Pi or a low-cost VPS and require minimal maintenance.

Code review systems like Gerrit take a fundamentally different approach. Gerrit is not a general-purpose Git hosting platform; it is a review system built around Git. Major projects like Android, Chromium and the Linux kernel use Gerrit because its review-first workflow enforces quality and governance in ways that pull-request-based systems do not.

Minimalist platforms like SourceHut reject the bloat of modern development platforms entirely. SourceHut provides Git hosting, issue tracking, CI

and mailing list-based code review using simple, composable tools. It appeals to developers who prefer Unix philosophy over feature-rich dashboards.

Enterprise solutions like Bitbucket Data Center integrate tightly with the Atlassian ecosystem. Organizations already using Jira for project management may find Bitbucket's integration valuable enough to justify using it for Git hosting.

Specialized or federated models are emerging as well. Forgejo is experimenting with ActivityPub-based federation that could eventually allow cross-instance collaboration similar to how Mastodon allows cross-instance social networking. These approaches are experimental but represent a genuine attempt to decentralize code hosting.

The right choice depends on the organization's size, requirements, infrastructure capabilities and risk tolerance. There is no single alternative that dominates the way GitHub dominates the broader market. This is both a challenge and an opportunity.

A Framework for This Book

This book is organized to build understanding from the ground up. It does not assume expertise in Git server infrastructure, but it does assume working familiarity with Git commands.

The early chapters establish foundational knowledge. Chapter 2 covers Git internals that matter for hosting and operations, explaining the distributed model, object storage and network protocols in terms relevant to infrastructure engineers. Chapter 3 deconstructs what a Git hosting platform actually is, distinguishing Git itself from the layers built on top of it.

The middle chapters provide deep dives into specific platforms and tools. Chapters 4 through 9 examine GitLab, Gitea, Forgejo, Bitbucket, Gerrit, SourceHut and other notable solutions. Each chapter covers architecture, features, deployment requirements, operational considerations and appropriate use cases. The goal is not to advocate for any particular platform but to provide enough technical detail that readers can evaluate each option against their own requirements.

Chapters 10 through 15 address cross-cutting concerns that apply regardless of platform choice. These include authentication and identity, branching

strategies, CI/CD integration, package management, security and supply chain protection. These topics are where the real architectural decisions live.

Chapters 16 through 19 focus on operational excellence: performance, scalability, high availability, backup and disaster recovery, observability and enterprise deployment patterns. Running a Git platform in production requires more than installation; it requires planning for scale, failure, compliance and change.

The final chapter addresses migration, interoperability and the future of code hosting. It provides a practical framework for making platform decisions based on organizational needs rather than market trends or vendor marketing.

Throughout the book, examples are production-oriented and configuration snippets are complete. The goal is that a reader should be able to take the guidance here and build, deploy and operate a working Git infrastructure. Where trade-offs exist between approaches, those trade-offs are explained rather than glossed over.

The book is written from an engineering perspective, not a marketing one. It draws on official documentation, architecture references, peer-reviewed research where available and real-world operational practices. Claims are supported by citations. Uncertainties are acknowledged. The intent is to provide a reference that remains useful as the landscape continues to evolve.

The GitHub monoculture is not unbreakable. It is simply the result of historical accidents, network effects and the inertia of existing workflows. Understanding the alternatives requires understanding Git's own design, which was built from the start to be distributed and independent. The next chapter revisits that design in ways that matter when you are no longer a client of someone else's platform but the operator of your own.

Chapter 2: Git Fundamentals for Infrastructure Engineers

Every Git hosting platform, every CI/CD integration, every security feature and every performance optimization sits on top of Git itself. Understanding how Git works internally is not optional for anyone responsible for hosting, scaling or securing Git infrastructure. This chapter covers the aspects of Git's architecture that directly impact server design and operation, assuming working familiarity with basic Git commands but no prior knowledge of Git internals.

The Distributed Model and Its Implications

Git is fundamentally different from centralized version control systems like SVN or CVS. The distinction is not merely that Git works offline. It is that Git was designed around a completely different model of collaboration.

In Git, every clone is a complete repository. When a developer runs `git clone`, they receive the entire history, all branches, all tags and every object that the source repository contains. There is no distinction between the “real” repository on a server and the “local copy” on a developer’s machine. Both are full repositories with the same structure, capabilities and integrity.

This design was intentional. Linus Torvalds created Git in 2005 to manage the Linux kernel development, which at the time was struggling with the limitations of BitKeeper (the previous tool) and needed a system that supported a large, globally distributed team of contributors with varying network connectivity. The distributed model ensured that no single point of failure could halt development.

For infrastructure engineers, the distributed model has critical implications:

There is no technical requirement for a central server. Git repositories can be shared directly between developers without any intermediary. A Git

hosting platform is a convenience layer, not a technical necessity. This is the fundamental insight that makes “Git beyond GitHub” possible. When you host your own Git infrastructure, you are adding convenience features (web interface, authentication, notifications) on top of a system that already works without them.

Backups are inherent to the model. Every developer’s clone is, in effect, a backup of the repository. If the central server fails, any clone can be used to restore the history. This is not a perfect backup strategy (clones may be partial, outdated, or deleted), but it is a structural property of Git that provides resilience that centralized systems cannot match.

The server’s role is coordination, not storage. A Git server does not hold the “authoritative” history in any technical sense. It holds the most socially agreed-upon version of the history. The server’s job is to coordinate who can update which references, to provide a convenient access point and to enforce organizational policies. Understanding this distinction matters when designing access control, governance and disaster recovery strategies.

Bandwidth and performance concerns are real. Every clone transfers the complete repository. For large repositories, this is expensive. Hosting platforms invest heavily in optimizing clone and fetch performance through techniques like partial clones, multi-pack-index and bandwidth throttling. These optimizations are responses to the distributed model’s inherent data duplication.

Objects, References, and Pack Files

Git stores all data as content-addressed objects. Every file, directory, commit, and tag is an object with a type, content and a unique identifier (object ID) computed as the SHA-1 hash of its type, size and content. Newer versions of Git support SHA-256 for enhanced security, but SHA-1 remains dominant in existing repositories.

There are four object types:

Blobs store file contents. A blob has no filename, no metadata, and no relationship to other files. It is purely the binary content of a file at a point in time. When Git tracks a file, it converts its contents to a blob and stores that blob. Every version of a file that differs in content creates a new blob.

Trees represent directories. A tree object contains a list of entries, each consisting of a mode (file permissions), a name, and a pointer to either a blob (for a file) or another tree (for a subdirectory). Trees form a hierarchy that represents the directory structure of a project at a given commit.

Commits are snapshots in time. A commit object points to exactly one tree (the complete directory state at that commit), zero or more parent commits. It also stores the author, committer, timestamp and commit message. The chain of parent commits forms the project history. A commit with no parents is the initial commit of a branch or repository.

Tags are named pointers to commits (or other objects). An annotated tag is itself an object with a tagger, message and date. A lightweight tag is simply a reference without additional metadata. Tags are commonly used to mark releases and significant milestones.

These objects are stored in `.git/objects/`. Initially, when you create a new blob or commit, Git stores it as a “loose” object: a single compressed file in a subdirectory named after the first two characters of its object ID, with a filename of the remaining characters. For example, a blob with ID `abc123...` would be stored at `.git/objects/ab/c123...`

Loose objects are fast to create and read, but inefficient at scale. As repositories grow, the filesystem overhead of thousands or millions of individual files becomes problematic. Inodes are consumed, directory lookups slow down and disk space is wasted due to filesystem block sizes.

Git solves this with **pack files**. Running `git gc` or `git repack` consolidates loose objects into a single binary file called a pack file (`.pack`), accompanied by an index file (`.idx`) that enables fast lookups. Pack files use delta compression: instead of storing every version of a file in full, Git stores one version completely and stores subsequent versions as differences from a base object. This dramatically reduces storage requirements for repositories with many similar files.

For a hosting platform, pack files matter in several ways:

Storage efficiency. Pack files can reduce repository storage requirements by 50 percent or more compared to loose objects. Platforms that manage many repositories must ensure regular garbage collection and repacking to keep storage costs manageable.

Network performance. Pack files are also used during fetch and push

operations. When a client fetches from a server, the server constructs a pack file containing the objects the client needs, applying delta compression to minimize transfer size. Efficient pack file generation is critical for clone and fetch performance.

Object lookup complexity. Reading an object from a pack file requires following delta chains. A heavily delta-compressed pack file may require reconstructing objects by applying multiple deltas, which adds CPU overhead. Platforms must balance compression ratio against read performance.

Large repository problems. Repositories with many loose unreachable objects can experience performance degradation. These objects cannot be packed if they have been deleted but not yet garbage collected, and they accumulate over time, especially in repositories with many short-lived branches. This is a known operational issue for platforms hosting active development repositories.

Remote Communication Protocols

Git supports multiple transport protocols for communication between client and server. Understanding these protocols is essential for configuring access, firewall rules and performance characteristics of a Git hosting platform.

SSH (Secure Shell) is the traditional method for Git over a network. The SSH protocol provides both encryption and authentication, making it ideal for secure access to private repositories. Git over SSH typically uses port 22 and relies on SSH keys for authentication.

The SSH protocol works through `git-shell`, a restricted shell that only allows Git commands. When a client pushes or fetches over SSH, the SSH connection authenticates the user, then runs either `git-upload-pack` (for fetching) or `git-receive-pack` (for pushing) on the server. The smart protocol commands are exchanged over the encrypted SSH channel.

SSH has several characteristics relevant to hosting platforms:

- It requires managing SSH keys for authentication, which becomes complex at scale.
- It is encrypted and secure by default.
- It requires only a single open port (22), which simplifies firewall configuration.

- Performance is affected by SSH overhead, though this is usually negligible compared to data transfer time.

Many platforms provide additional SSH configuration options like connection rate limiting, key fingerprint logging and integration with identity providers for automated key management.

Smart HTTP is Git's HTTP-based protocol and is now the dominant transport for most hosting platforms. It uses the HTTP protocol to carry Git's smart commands, typically over HTTPS for encryption. Smart HTTP works by deploying `git-http-backend` as a CGI script or server module that handles Git-specific requests.

The protocol follows a specific flow. The client initially requests `info/refs` to discover available references. For Git protocol version 2, the request includes a service parameter indicating `git-upload-pack` or `git-receive-pack`. Subsequent requests are made directly to the service endpoint, with negotiation and data transfer occurring over HTTP connections.

Key characteristics of Smart HTTP:

- It uses standard web ports (80 for HTTP, 443 for HTTPS), which means it works through most firewalls and proxies without special configuration.
- It integrates naturally with web authentication mechanisms (Basic Auth, OAuth, tokens, cookies).
- It is stateless, which enables horizontal scaling with load balancers.
- It can serve both Git operations and a web interface from the same URL.

Protocol version 2, introduced in 2018, provides several improvements over the original version. It is more extensible, supports multiple commands over a single connection and provides better error handling. Protocol v2 also enables features like partial clones, where a client can request only references without all blob data, significantly reducing clone times for large repositories.

The git protocol (`git://`) is Git's native unencrypted protocol, designed for public repository access. It uses a dedicated daemon (`git-daemon`) that listens on port 9418. The git protocol is lightweight and efficient for read-only access but provides no authentication or encryption.

Most modern platforms do not support the git protocol. GitHub discontinued `git://` access in 2021 due to security concerns. Self-hosted platforms

may still offer it for internal networks where performance matters more than encryption, but it is generally discouraged.

Local and file-based access is also supported. Git can clone and fetch directly from a directory on the same machine or over a network file system like NFS or SMB. This is useful for backups, mirrors and internal sharing but lacks the control and security of networked protocols.

For a production Git hosting platform, the recommended configuration is:

- HTTPS (Smart HTTP) for all web access and most Git operations, with TLS certificates properly configured.
- SSH for command-line operations and CI/CD runners that prefer key-based authentication.
- No git:// protocol unless there is a specific performance requirement in a trusted internal network.
- Internal mirrors or replicas accessible via file-based or local access for high-performance operations.

Hooks, Attributes, and Configuration Layers

Git provides multiple mechanisms for customization and policy enforcement. Hosting platforms build on top of these mechanisms to implement access control, code review, automated testing and other organizational requirements.

Server-side hooks are scripts that run on the Git server in response to repository events. Key hooks include:

- **pre-receive:** Runs before any ref updates are accepted. This is where most policy enforcement happens. A pre-receive hook can inspect incoming commits, enforce naming conventions, require signed commits, verify that CI passed, or reject pushes that violate branching rules.
- **update:** Similar to pre-receive but runs once per ref being updated. Useful for per-branch policies.
- **post-receive:** Runs after all updates are accepted. This is where notifications, webhooks, and CI triggers are typically invoked.
- **post-update:** Runs after post-receive. Used for updating server-side caches or mirrors.

- **pre-receive** and **post-receive** are the most commonly used in hosting platforms. They can be written in any scripting language and receive ref information on stdin in the format: old-sha1 new-sha1 refname.

For example, a pre-receive hook that enforces signed commits might parse each incoming commit, verify its GPG or SSH signature against an allowlist of trusted keys and reject the push if any commit is unsigned:

```

1  #!/bin/bash
2  while read oldrev newrev refname; do
3      # Skip deletes
4      if [ "$newrev" = "0000000000000000000000000000000000000000" ]; then
5          continue
6      fi
7
8      # Get list of new commits
9      if [ "$oldrev" = "0000000000000000000000000000000000000000" ]; then
10         range="^$newrev"
11     else
12         range="$oldrev..$newrev"
13     fi
14
15     # Check each commit for signatures
16     git rev-list --no-merges $range | while read commit; do
17         if ! git cat-file commit "$commit" | grep -q "^gpgsig"; then
18             echo "error: Unsigned commit detected: $commit" >&2
19             exit 1
20         fi
21     done
22 done

```

This is the kind of policy enforcement that hosting platforms implement in their own code, but understanding the underlying hook mechanism clarifies how Git itself supports governance and automation.

Git attributes (.gitattributes) define per-path behaviors that affect how Git handles files in a repository. Attributes control:

- Line ending conversion (text vs binary)
- Merge strategies for specific file types
- Diff formatting for binary or specialized files
- Export-ignore behavior for files that should not appear in archives

Git attributes are repository-specific and do not require server-side configuration. They are stored in the repository itself, which makes them portable but also means they can only enforce policies for files already tracked.

Git configuration exists at multiple levels with increasing precedence:

1. **System-level** (/etc/gitconfig): Applies to all users on a machine.
2. **User-level** (~/.gitconfig): Applies to a specific user.
3. **Repository-level** (.git/config): Applies only to a specific repository.

Hosting platforms typically configure system-level settings for all repositories they manage, such as disabling certain features, setting default hooks, or configuring pack compression parameters. They may also set repository-level configuration during repository creation or through administrative APIs.

Bare repositories are the standard form for server-side Git repositories. A bare repository contains only the .git directory contents without a working tree. Commands like `git clone` create non-bare repositories with a working tree on the client but expect to push to bare repositories on the server.

Bare repositories are created with `git init --bare`. They cannot have commits made directly in them because there is no working tree. All changes arrive through push operations. This is exactly the behavior a Git server needs: accept pushes, reject direct local modifications, serve as a reference point for clients.

Most hosting platforms automatically create and manage bare repositories behind the scenes. The platform's job is to provide authenticated, controlled access to those bare repositories through SSH, HTTP, or both.

Git Internals That Affect Server Design

Several deeper Git internals directly impact how a hosting platform must be designed and operated:

Reference management. Git stores branches and tags as references, which are simply text files containing 40-character SHA-1 hashes (or 64 characters for SHA-256) in `.git/refs/`. A branch is just a named pointer to the latest commit on that branch. When a developer pushes to a branch, the server updates the corresponding reference file.

Hosting platforms must manage reference updates atomically and with proper access control. A push that updates multiple branches must either succeed for all branches or fail for all; partial updates would leave the repository in an inconsistent state. Git handles this at the protocol level, but platforms add additional constraints like branch protection rules, required reviewers, and CI verification.

The object database is append-only. Git never modifies or deletes objects once created. New objects are added; old objects become unreachable but may remain in the store until garbage collection removes them. This immutability is fundamental to Git's integrity model. If a commit's hash matches its content, the commit has not been tampered with.

For hosting platforms, this means storage only grows. Repositories accumulate objects over time, especially with many branches, forks and large files. Platforms must implement aggressive garbage collection, LFS (Large File Storage) for binary assets and policies that discourage practices like committing large binaries or maintaining thousands of long-lived branches.

Pack file generation is CPU-intensive. Creating optimized pack files with deep delta chains requires significant CPU. When a server serves a large clone, it may need to generate a custom pack file on the fly. Under high load, this can become a bottleneck.

Production platforms address this through pre-generated packs, multi-pack-index to speed up lookups across many pack files and caching strategies. GitLab, for example, uses pre-pack operations during off-peak hours to keep pack files optimized and reduce on-the-fly pack generation.

Authentication is not built into Git. Git itself has no concept of users, passwords, or access control. Authentication is entirely the responsibility of the transport layer (SSH keys for SSH, HTTP authentication for HTTPS) and the hosting platform. This is by design: Git is a version control system, not an access control system. The platform adds the access control layer on top.

For platforms, this means implementing authentication from scratch or integrating with existing identity providers. The platform must map authenticated identities to Git permissions, manage SSH keys or tokens and enforce fine-grained access policies. This is often the most complex part of a Git hosting platform's architecture.

Understanding these internals provides context for everything that follows in this book. When you read about GitLab's resource requirements, Gerrit's

review workflow, Gitea's lightweight design, or any platform's performance characteristics, you are reading about different implementations built on top of this same Git foundation. The differences between platforms are not about Git itself but about how they wrap Git with authentication, web interfaces, integrations and operational tooling.

The next chapter deconstructs that wrapper: what a Git hosting platform actually is, what components it requires, and how the architecture varies across different approaches.

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