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Remote Verification System for Mizar Integrated with Emwiki

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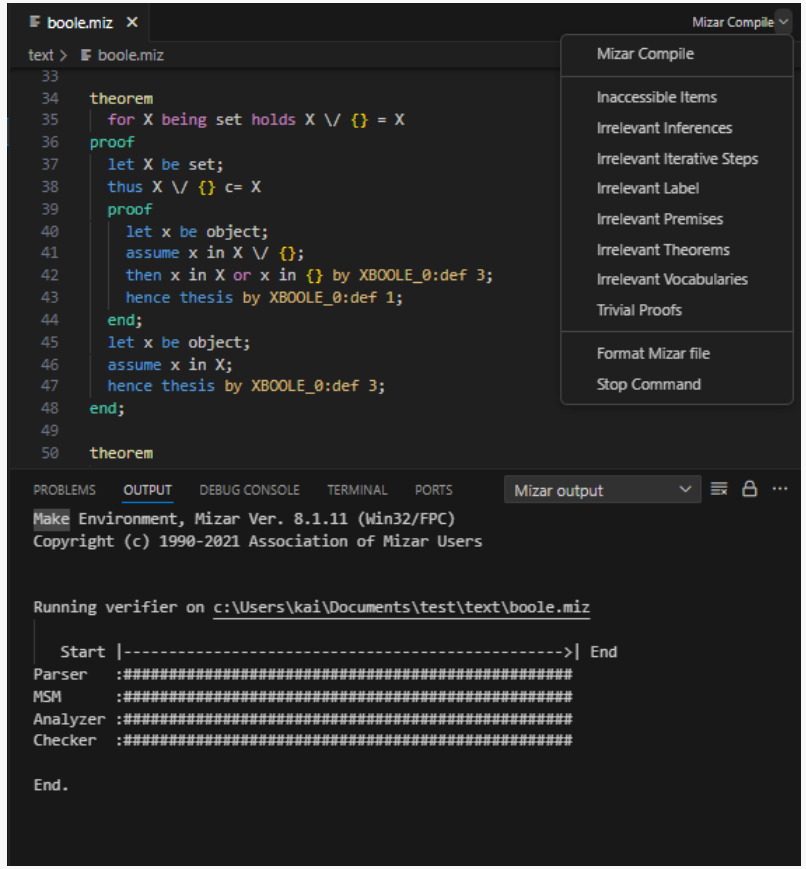
VSCode Mizar Extension

- **History**
  - Development has been started around 2020.
  - Provide an easy-to-use Mizar IDE for beginners.
- **Features**
  - Syntax highlighting
  - Code formatting
  - Execution and halting of Mizar commands
  - Definition jump and hover functions
    for referencing cited theorems and definitions

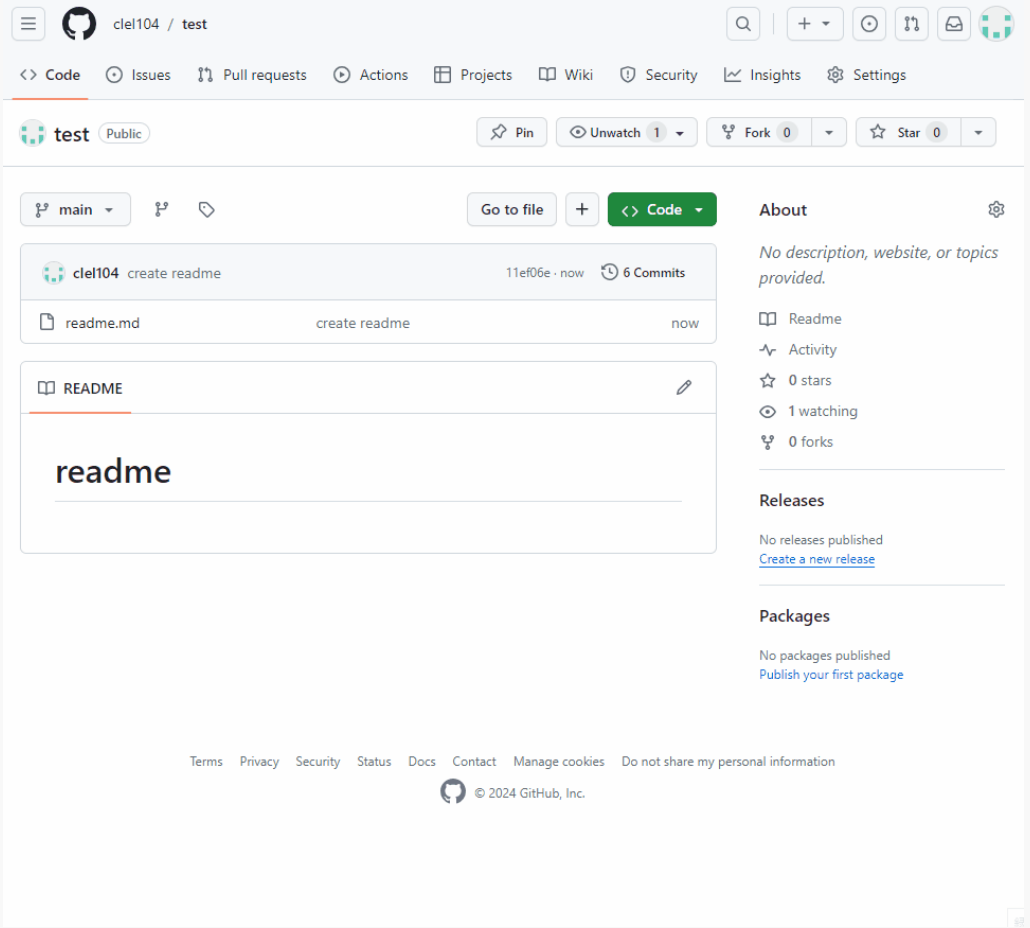


Contribution

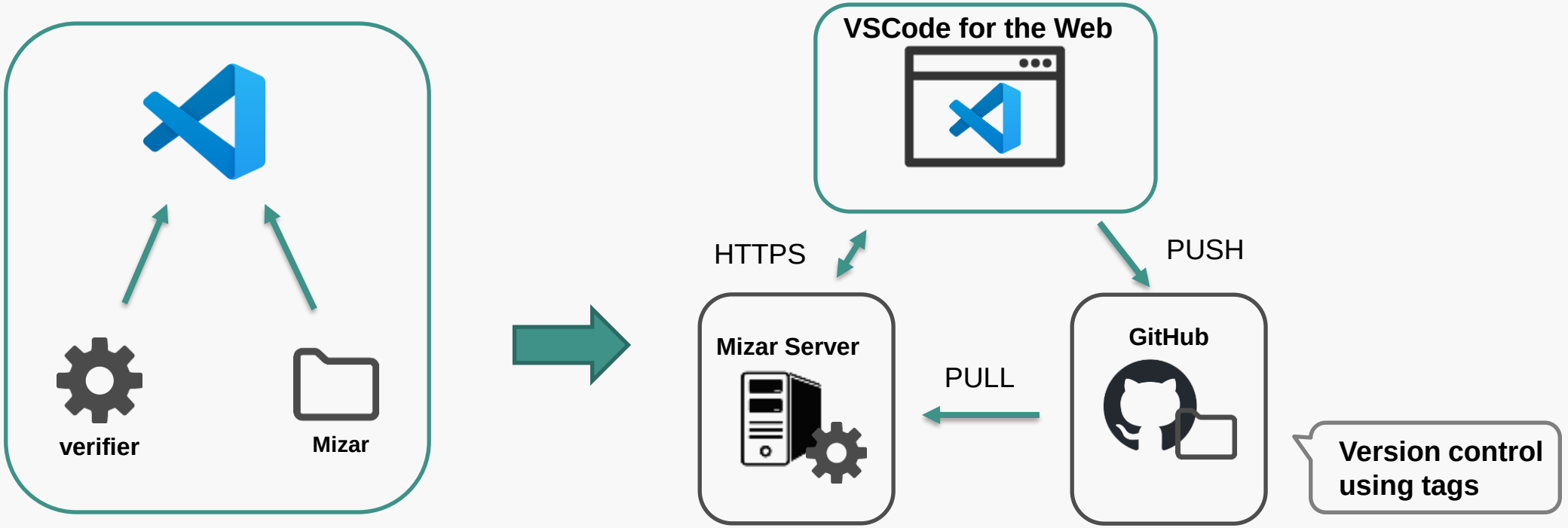
- **Mizar Server**
  - Eliminate local setup for Mizar developers.
  - Execute Mizar commands on a remote server.
- **VSCode for the Web Extension**
  - Use Mizar Server with VSCode for the Web.
  - Implement a remote verification environment in emwiki.

VSCode for the Web

- **Cloud-based Code Editor**
  - No installation required.
  - Create projects and code online instantly.
  - Collaborate seamlessly with GitHub-synced environments.
- **GitHub Integration**
  - Launch directly from GitHub repositories with one click.
  - Reflect immediately on GitHub with a commit.



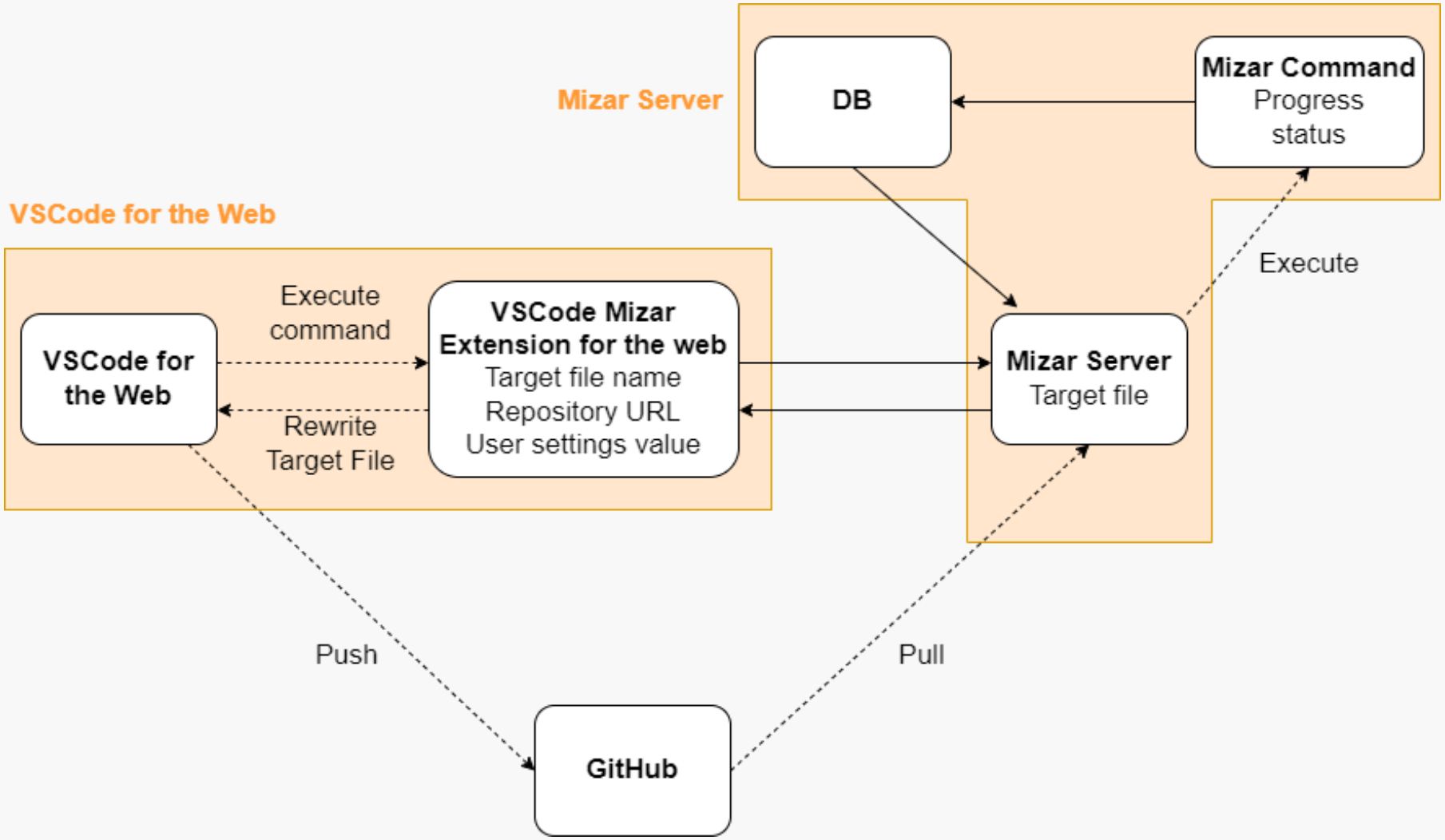
Port the Mizar Extension to VSCode for the Web Extension



Mizar Extension
Access files placed locally

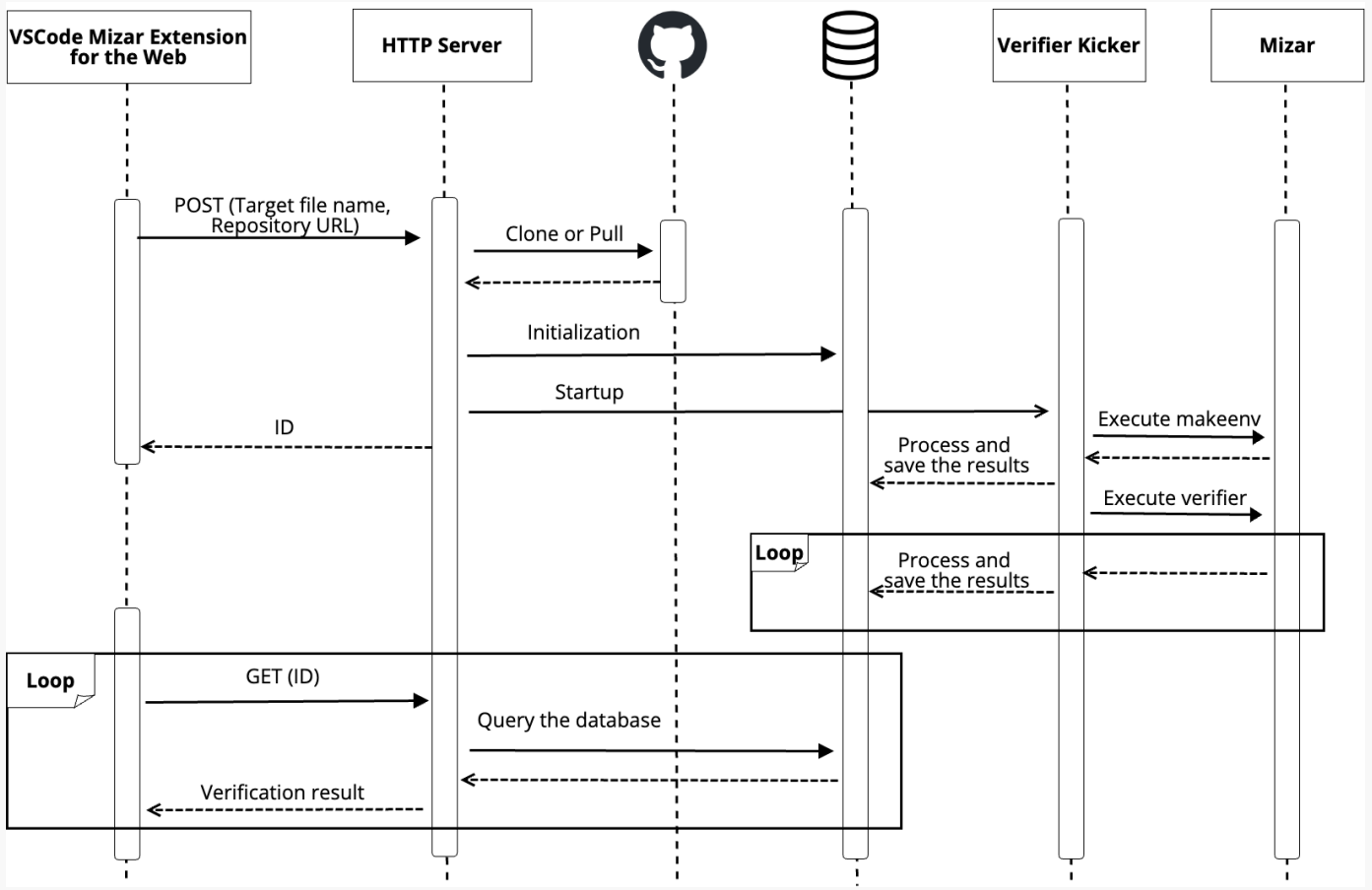
VSCode for the Web Extension
Retrieve information from Mizar Server and GitHub

Architecture Diagram

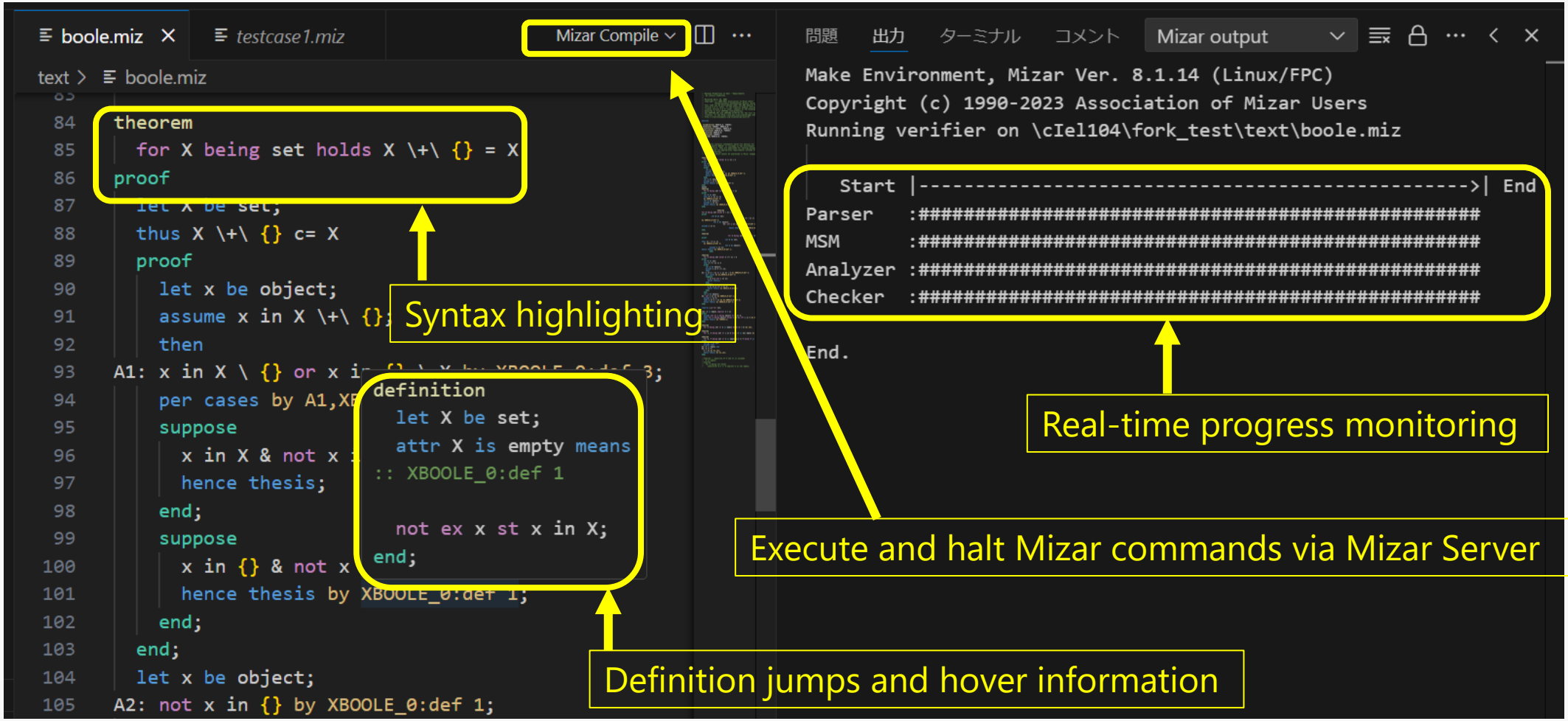


Mizar Server

- **Cloud-based processing**
  - Access via HTTP API
  - No local setup required
  - Cross-platform compatibility
- **Asynchronous execution**
  - Execute Mizar commands in background
- **Secure and integrated**
  - TLS/SSL communication
  - Integrate GitHub repository

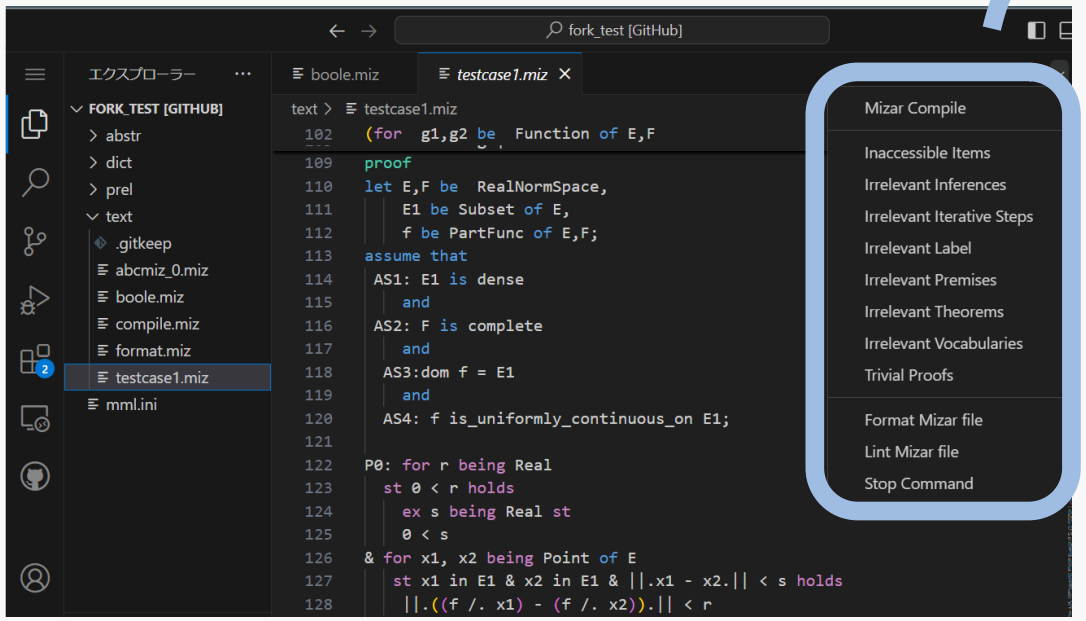


VSCode for the Web Extension



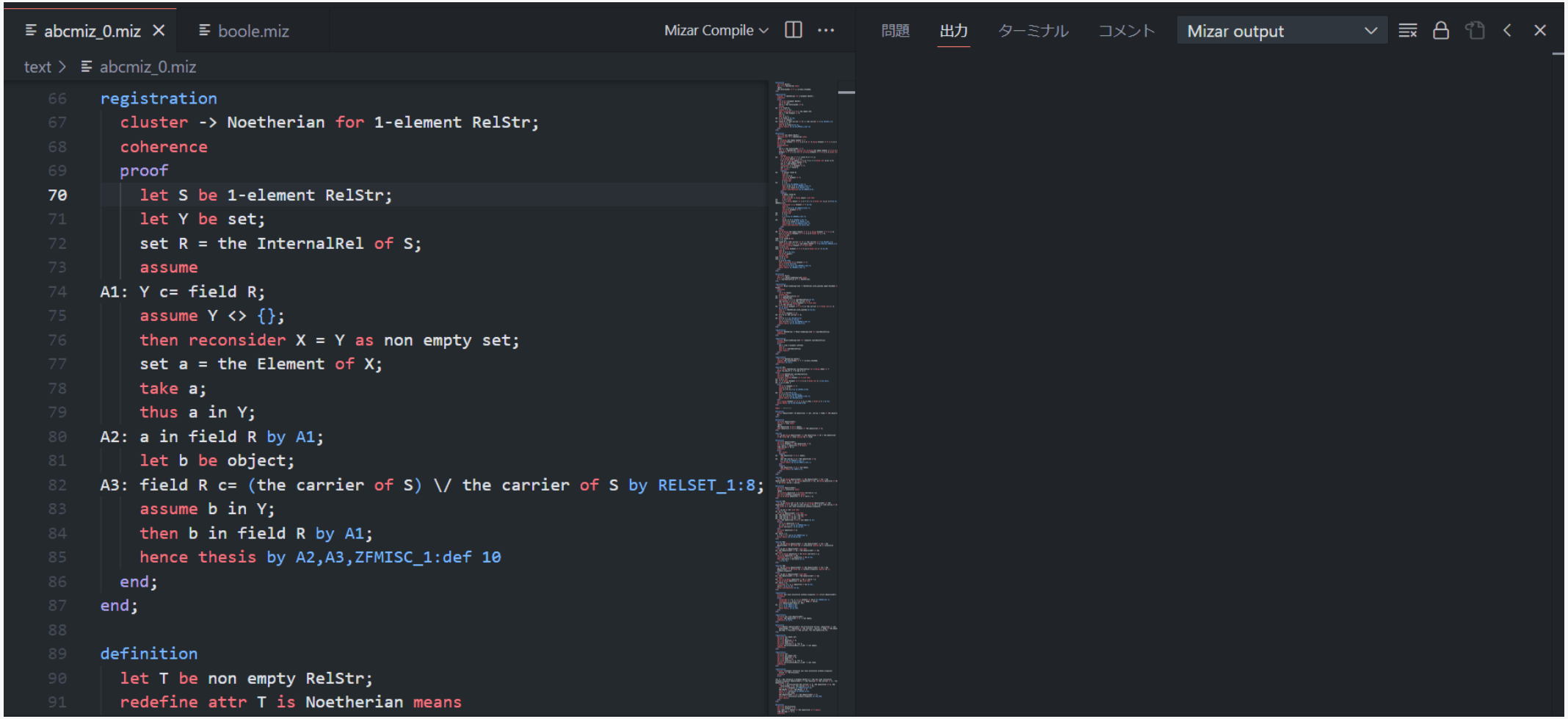
Commands in the VSCode for the Web Extension

- **Available commands**
  - Verification
  - Brush-up hints
  - Formatter and linter



Category	Command	Features
Verify	Mizar Compile	Perform verification of the proof.
Brush-up hints	Inaccessible Items	Detect unreachable items.
	Irrelevant Inferences	Detect irrelevant inferences.
	Irrelevant Iterative Steps	Detect redundant iteration steps.
	Irrelevant Label	Detect redundant labels.
	Irrelevant Premises	Detect irrelevant assumptions.
	Irrelevant Theorems	Detect redundant theorems.
	Irrelevant Vocabularies	Detect irrelevant words in the proof.
	Trivial Proofs	Detect trivial proofs.
Other	Format Mizar file	Format proofs.
	Lint Mizar file	Detect deeply nested blocks.
	Stop Command	Terminate commands.

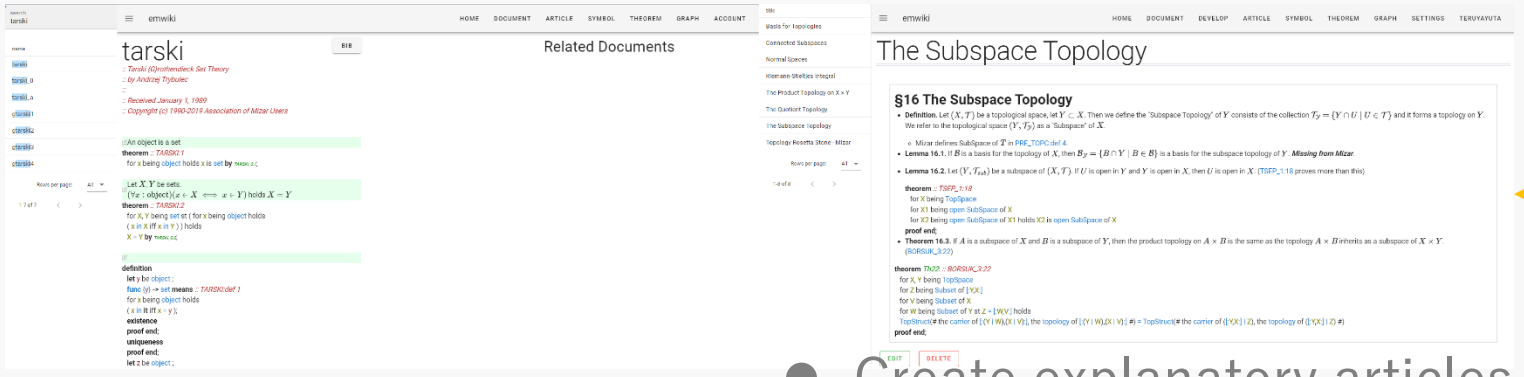
Demo Video


abcmiz_0.miz
boole.miz
Mizar Compile
text > abcmiz_0.miz
問題
出力
ターミナル
コメント
Mizar output
registration
cluster -> Noetherian for 1-element RelStr;
coherence
proof
let S be 1-element RelStr;
let Y be set;
set R = the InternalRel of S;
assume
A1: Y c= field R;
assume Y <> {};
then reconsider X = Y as non empty set;
set a = the Element of X;
take a;
thus a in Y;
A2: a in field R by A1;
let b be object;
A3: field R c= (the carrier of S) \/ the carrier of S by RELSET_1:8;
assume b in Y;
then b in field R by A1;
hence thesis by A2,A3,ZFMISC_1:def 10
end;
end;
definition
let T be non empty RelStr;
redefine attr T is Noetherian means

Integration of Remote Verification on emwiki

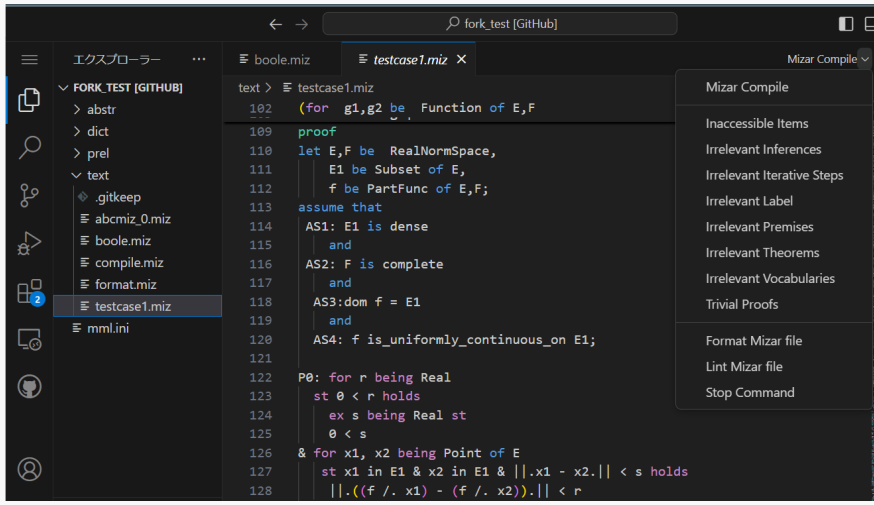
- **Enhancement**
  - Integrate MML browsing, development, and documentation in one platform
  - Realize streamline Mizar workflow through seamless remote verification
  - Enhance accessibility and collaboration for the Mizar community

emwiki



- Browse the library
- Create explanatory articles

VSCode for the Web



- Develop MML

Comparative evaluation: Remote vs Local Environment

Aspect	Remote System (VSCode for the Web)	Local System (Mizar Extension)
Setup	Simple GitHub repository setup	Manual environment configuration
MML Updates	Automatic	Manual
Core Features	Syntax highlighting, Command execution, Definition jumps	Syntax highlighting, Command execution, Definition jumps
Unique Features	New Linter/Formatter functionality	-
Performance	12.27 seconds	10.02 seconds
Accessibility	Access any device with web browser	Requires local installation
Network Connection	Required	Not required

Conclusion

- **Successfully implemented a remote verification environment**
  - Eliminates need for local setup
  - Integrates with emwiki platform
- **VSCode for the Web Extension is now available on emwiki**
  - Combines library browsing, documentation, and development in one-platform
  - Enhances accessibility for Mizar users

Future Work

- **Performance optimization**
  - Explore parallelization of verification processes
  - Investigate high-performance server deployment
- **Improve user experience**
  - Simplify account management and GitHub integration
  - Enhance accessibility across different devices and platforms
- **Potential feature expansions**
  - Adding collaborative editing capabilities
  - Integration with other mathematical tools and libraries