Building Trunk:
A Postgres Extension Registry and CLI Supporting Tembo Cloud

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Tembo
Backstory
Backstory

**Tembo**

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Managed Postgres solution - Tembo Cloud

**Vision**

Postgres for everything. Use-case optimized flavors of Postgres, powered by extensions

Ability to install and use any extension, even user-provided extensions

We knew we’d need some extension management system to pull this off
Backstory

**Trunk**

A Postgres extension registry and CLI

Binary extension packaging

Open to the community and open source

Powers Tembo Cloud’s extension management experience
Backstory

**Tembo Cloud**
We spent Q1 2023 building Tembo Cloud V1

Extensions were baked into our Postgres container images

We wanted a way install extension binaries on the fly without rebuilding container images

**Extension Registry**

Started exploring the extension ecosystem for existing solutions
## Backstory

### PGXN

| + Backed by the community |
| + Around since 2011 |
| - Source distribution, not binary |
| - Little development since 2012 |

### apt / yum

| + Backed by the community |
| + Binary distribution |
| - Smaller subset of extensions available |
| - Review process for adding could slow us down |

### Building our own

| + Full control over integration with Tembo Cloud |
| + Binary distribution |
| + We could build new features quickly |
| + We could publish new extensions quickly |
| - How will the community react? |
| - Recreating the wheel? |
Inspiration
Inspiration

**Astronomer Registry for Airflow**

A handful of Tembo’s employees worked at Astronomer - managed service for Apache Airflow

Community registry for DAGs, Providers and Modules

We wanted to build something similar, but for Postgres extensions
Inspiration

**PGXN / apt / yum**

We wanted to take the best of what the current offerings had to offer and build upon that.

**Crates.io**

We wanted the experience to be as simple and enjoyable as building, publishing and installing Rust crates.

**Vision**

- Discoverability
  - Categories
  - Rating system
  - Certification
  - Cloud provider support
- Build any extension
  - SQL
  - C/SQL
  - PGRX
- Simple publishing
  - Like `cargo publish`
- Simple installation
  - Like `cargo install cargo-pgrx`
Hopes and Dreams
Hopes and Dreams

Community involvement

- Extension publications
- Code contributions

Multi-platform support

Multiple versions of Postgres

The one-stop-shop for Postgres extensions
How It Works
How It Works

**CLI**

Built in Rust

Uses different build images based on extension type detected

Packages extension files into `<trunk-project-name>_<version>_<pg-version>.tar.gz`

Publishes to registry with `trunk publish`

Installs from registry `trunk install`

**Registry**

Built in Rust

Backend stores extension metadata

S3 bucket stores `tar.gz` file
Create Trunk bundle:
  bitcode/src/semver/src/semver.bc
  bitcode/src/semver/index.bc
  semver.so
  licenses/LICENSE
  extension/semver--0.10.0--0.11.0.sql
  extension/semver--0.11.0--0.12.0.sql
  extension/semver--0.12.0--0.13.0.sql
  extension/semver--0.13.0--0.15.0.sql
  extension/semver--0.15.0--0.16.0.sql
  extension/semver--0.16.0--0.17.0.sql
  extension/semver--0.17.0--0.20.0.sql
  extension/semver--0.2.1--0.2.4.sql
  extension/semver--0.2.4--0.3.0.sql
  extension/semver--0.3.0--0.21.0.sql
  extension/semver--0.21.0--0.22.0.sql
  extension/semver--0.22.0--0.30.0.sql
  extension/semver--0.3.0--0.4.0.sql
  extension/semver--0.3.0--0.31.0.sql
  extension/semver--0.31.0--0.31.1.sql
  extension/semver--0.31.1--0.31.2.sql
  extension/semver--0.31.2--0.32.0.sql
  extension/semver--0.32.1.sql
  extension/semver--0.5.0--0.10.0.sql
  extension/semver--unpackaged--0.2.1.sql
  extension/semver.control
  extension/semver.sql
  manifest.json

Packaged to ./.trunk/pg_semver-0.32.1-pg15.tar.gz
pg_semver
A semantic version data type for PostgreSQL.

semver 0.32.0

This library contains a single PostgreSQL extension, a data type called "semver". It's an implementation of the version number format specified by the Semantic Versioning 2.0.0 Specification.

Installation

To build semver:

```
make
make install
make installcheck
```

If you encounter an error such as:

Details

<table>
<thead>
<tr>
<th>About</th>
<th>Data / Transformations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Data / Transformations</td>
</tr>
<tr>
<td>Version</td>
<td>0.32.1</td>
</tr>
<tr>
<td>Last updated</td>
<td>about 2 months ago</td>
</tr>
<tr>
<td>License</td>
<td>PostgreSQL</td>
</tr>
<tr>
<td>Architecture</td>
<td>x86-64</td>
</tr>
<tr>
<td>Operating system</td>
<td>Debian/Ubuntu</td>
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</tbody>
</table>

[github.com/theory/pg_semver](https://github.com/theory/pg_semver)
trunk install pg_semver
Using pkglibdir: /usr/lib/postgresql/16/lib
Using sharedir: /usr/share/postgresql/16
Using Postgres version: 16
info: Downloading from: https://cdb-plat-use1-prod-pgtrunkio.s3.amazonaws.com/extensions/pg_semver/pg_semver-pgl6-0.32.1.tar.gz
info: Dependent extensions to be installed: []
info: Installing pg_semver 0.32.1
[+] bitcode/src/semver/src/semver.bc => /usr/lib/postgresql/16/lib
[+] bitcode/src/semver/index.bc => /usr/lib/postgresql/16/lib
[+] semver.so => /usr/lib/postgresql/16/lib
info: Skipping license file licenses/LICENSE
[+] extension/semver-0.10.0-0.11.0.sql => /usr/share/postgresql/16
[+] extension/semver-0.11.0-0.12.0.sql => /usr/share/postgresql/16
[+] extension/semver-0.12.0-0.13.0.sql => /usr/share/postgresql/16
[+] extension/semver-0.13.0-0.15.0.sql => /usr/share/postgresql/16
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[+] extension/semver-unpackaged-0.2.1.sql => /usr/share/postgresql/16
[+] extension/semver.control => /usr/share/postgresql/16
[+] extension/semver.sql => /usr/share/postgresql/16

*******************************
* POST INSTALLATION STEPS *
*******************************

Install the following system-level dependencies:
On systems using apt:
   libcrypto6
Enable the extension with:
   CREATE EXTENSION IF NOT EXISTS semver CASCADE;
State of the Project
State of the Project

**Tembo Cloud**
- 200+ extensions
- Powers extension management experience
- Likely Trunk’s #1 user

**Community**
- A lot of site traffic
- Minimal community involvement
- Repo is not contributor friendly
State of the Project

**Did We Solve The Problem?**

For Tembo Cloud... yes!

For the community... no!

But we helped bring more awareness to opportunities for improving the extension ecosystem

And more extension management tools were introduced

Why we're all here today!
Lessons Learned
Lessons Learned

It’s a really hard problem to solve!

The extension ecosystem is the wild west!

Community involvement is crucial!

We should have reached out to David in the very beginning!
The Future of Trunk
The Future of Trunk

Trunk will continue to be a core component of the extension management solution in Tembo Cloud.

It’s paved the way for binary packaging and distribution in PGXN v2.

Will inform and be the basis of binary packaging / distribution / installation features in PGXN v2.
Thank You!