Fluree Transforms:

**Data Security**

- **Provable History**
  Prove not only the integrity of every piece of data in your system - but also the origin of every transaction.

- **Manipulation-Proof**
  As an append-only log, Fluree outputs a provable and complete audit trail, resistant to tampering.

**Data Access**

- **Time-Travel Query**
  Run queries against any single point in time - effectively giving any application an instantaneous "rewind" capability.

- **Semantic Graph DB**
  Fluree exposes data in a rich semantic graph database, capable of running highly analytical aggregations.

**Data Sharing**

- **Optional Decentralization**
  Optionally decentralize your ledger with programmable rules and consensus for smart governance.

- **Direct Data Sharing > APIs**
  Secure access and write permissions where they belong - on the data tier rather than stitching together a web of APIs.
Fluree Architecture

Most modern databases run the transactor engine (the “writes”) and the query peer (the “reads”) on the same node (server). In order to provide the scalability of a modern database and the immutable and decentralized benefits of a blockchain, Fluree has separated the traditional database into two parts: FlureeDL and FlureeDB.

FlureeDL is a data optimized blockchain that handles every transaction. FlureeDB makes use of FlureeDL with a semantic query engine for powering enterprise applications. Each part runs and scales independently, depending on your application needs. Access data with GraphQL, SPARQL, or FlureeQL (JSON/REST).
Immutable — every update is recorded as a block that includes the prior block’s hash, and itself is hashed using SHA 3-256. This means FlureeDL’s ledger is a complete and provable audit trail of every data change, ever.

Pluggable Consensus — optionally decentralize your ledger across a network of participants with the choice of RAFT or PBFT consensus mechanisms for transparency, validation, and voting.

Configurable Blockchain — create your unique data schema and enforce its rules for ledger updates with Turing-complete SmartFunctions™

Partition-friendly — FlureeDL can partition data to lie on multiple blockchains (and FlureeDB can bring it all back together in query, granted it has read access to all sources)

Standard and Versatile Data Format — FlureeDL outputs immutable ‘block’ data in W3C standardized RDF format for turnkey integrations. RDF is readily consumable for any database, existing app, or, of course, FlureeDB.
When an application wants to create, update or retract data in Fluree, a transaction is submitted to any server(s) in the applicable FlureeDL network. These server(s) validate the transaction against your schema and rules, ultimately outputting RDF-formatted data that represents the deltas of the database, assuming a valid transaction, along with metadata about the transaction. RDF data is universally standard and can be piped into nearly any enterprise database or application.

- FlureeDL acts as a fully-immutable historic audit trail
- Each block represents every chronological state change
- Uses a SHA3-256 hash to lock in records
- Blocks are collections of flakes

Flake: An assertion about a fact at a specific point in time.
FlureeDL Governance

FlureeDL is a programmable ledger that validates every transaction along various checkpoints. Beginning with an identity check, schema logic rules, and moving on to SmartFunctions that control the permission rights, FlureeDL allows for a secure custom blockchain, whose rules can dynamically change along with application or consortium requirements.

**Signature**
Every transaction signed by submitting user’s unique key

**Schema**
Transaction checked against schema rules (aka no letters in a digit field)

**SmartFunctions (spec)**
Transaction checked for valid values (aka an email field must contain ‘@’)

**SmartFunctions (Permission Layer)**
Transaction checked against write permission layer (aka company A can’t update company B’s financials)

**Duplicate Check**
Transaction hash checked against all prior transactions for possible duplicates, effectively guarding against “middle-man” attacks

**Custom, Flexible Governance Models**
SmartFunctions, Fluree’s Turing-complete functional programming language, can be leveraged to enforce custom rules in ongoing governance.
FlureeDL Deployment

FlureeDL can be used to privately power applications, but can also be decentralized - in part or in whole - across a network of established participants.

- **Development**: Run as a single server
- **Internal**: Redundant Transactor Group
- **External**: Decentralized Ledger

Run Multiple Blockchains and Build Your Ecosystem

Fluree allows companies to partition their data to lie on multiple FlureeDL blockchains - each with their own governance rules and consensus properties. This allows for the decentralization of public/consortium information, while simultaneously preserving privacy and compliance when needed.

FlureeDB can thus query every FlureeDL to which it has access permission, and retrieve results as a unified data set.

This feature allows for a digital ecosystem of consortia leveraging multiple FlureeDLs and combining their RDF data to power custom applications.
Graph Database — Optimized to work with FlureeDL RDF data, FlureeDB is a rich graph database capable of single-digit millisecond queries and powerful analytical aggregations.

Time Travel — Query against any historical version of your immutable database, retrieve instantly available results.

Familiar Language Support — SparQL, GraphQL and FlureeQL (JSON REST API) query support make FlureeDB an easy tool for developers to pick up and start building.

Join data in query - Query across data stores (either Fluree or otherwise), securely joining RDF data.

ACID-Compliant — Transactional consistency so your business applications can scale with reliable data.
FlureeDB Overview

FlureeDB is a rich consumer of FlureeDL RDF output, exposing it as a semantic graph database. With FlureeDB, you can build out and scale enterprise-grade applications that make sophisticated use of FlureeDL.

Enterprise Graph DB

A semantic graph database is an excellent technology to power enterprise applications. FlureeDB natively understands relationships and time - and can be leveraged for highly analytical aggregations and graph queries.

Leverage FlureeDL History

Because FlureeDL records every state change, FlureeDB can leverage its immutable history in “time travel query,” in which developers can optionally query their database against any point in time (both past and hypothetical future.)

Secure Access Permissions and Rules

The same functional programming logic used to govern FlureeDL can be used to secure data access from unwanted parties. Databases today require a permission layer be built at the API layer of an application. By embedding access permission logic directly as meta-data, FlureeDB eliminates the risk of data leaks.
Fluree Leadership

Brian Platz, Co-founder and Co-CEO

Brian was an entrepreneur and executive throughout the early internet days and SaaS boom, having founded the popular A-list apart web development community, along with a host of successful SaaS companies. Previous to establishing Fluree, Brian co-founded SilkRoad Technology which grew to over 2,000 customers and 500 employees in 12 global offices. Currently sits on board for Odigia and advises Fabric, Inc.

Flip Filipowski, Co-founder and Co-CEO

Flip was the CEO, COO of Cullinet, the largest software company of the 80’s and founder and CEO of Platinum technology, inc., 8th largest global software company at time of sale to CA for 4 billion dollars. Upside Magazine’s Top 100 most influential people in Information Technology, winner of both the E&Y and the Merril Lynch Entrepreneur of the year award. Currently sits on the Board for Fuel50, Veriblock, and MissionMode.

Brian and Flip have four decades of combined experience in enterprise software - and, becoming inspired by blockchain’s utility, have worked to apply the same security, trust, transparency, and immutability benefits to the industry they know best - business SaaS.
Fluree Use Cases

As with any other industry-agnostic database technology, Fluree can be used as a toolkit to build out a very wide range of applications. Fluree is the toolkit for the following possible use cases:

**Build Custom, Data-Friendly Blockchains**

Public blockchains are purpose-built and inflexible. Private consortia chains are modular but not meant for enterprise records management. Fluree allows developers to build the blockchain infrastructure that make sense for their industry, compliance regulations, and specific business case.

**Data management partner to public or private blockchain projects**

Deploying an application on Ethereum or Hyperledger has its benefits - until your application needs to store and leverage data in a unified format. Running Fluree as the data store alongside public or enterprise blockchains allows for a complete and integrative blockchain solution.

**Enable Trusted Data Collaboration**

With a standard data format, optional decentralization, and custom rules configuration, Fluree can power deep interoperability across business units, organizations, or entire industries.

**Run a Permissioned, Decentralized Data Store**

Collaborate with network participants on secure transactions, power your supply chain with end-to-end traceability, track and optimize the lifecycle of a construction project, collaborate around KYC checks. Fluree is the data store solution built for trusted, secure sharing.

**Build Enterprise-Grade, Sophisticated Applications**

Fluree can solely power enterprise-grade applications just like any other enterprise-capable database. With Fluree, however, you get unprecedented data integrity, time-travel, audit trails, and the ability to decentralize - in part or in whole - your application data.

**Output a total and complete audit trail**

Leverage the power of blockchain immutability - our ledger provides businesses with a complete and provable audit trail of every version of your database from its genesis block.
Analyst and Media Reaction

"The Fluree team has a proven track record in building enterprise software. Its practical and accessible approach to blockchain will grab the attention of businesses." — 451 Research

"The multi-consensus mechanism used in FlureeDB lets businesses create an internal database offering complete privacy, or to create a completely decentralized database for total transparency." — Dataversity

"From food to car maintenance to legal documents to business audits to real estate transactions, businesses and individuals want to know that digital records and information are accurate and haven’t been altered. They want proof. With FlureeDB, businesses both large and small can quickly and easily provide that guarantee." — Clabby Analytics

"Beyond providing an immutable blockchain core for tamper resistance and a provable historic audit trail, FlureeDB provides “smart” database functions for programmatic control over data updates, consensus rules, or permissions; a “Time Travel” point in time query; and a graph database format with analytical query logic support." — Database Trends and Applications

10 Coolest Big Data Products of 2017
CRN Magazine

10 Data Analytics Vendors to watch in 2018
The Channel Co.

Top 20 Coolest Cloud Vendors - 2018
CRN Magazine

Startups to Watch - 2018
Database Trends and Applications

Top 10 Startup in North Carolina - 2018
NC Tech Association

Startup Grind Accepted Startup - 2019
Google Startup Grind
About Fluree

Co-founded in 2016 by Flip Filipowski and Brian Platz, Fluree PBC is a Delaware-registered Public Benefit Corporation focused on transforming data security, ownership, and access. Fluree is the first solution that brings blockchain into the data tier with a fully-functioning and modern database. By leveraging blockchain as a core element in its underlying architecture, FlureeDB stands as a unique and needed infrastructure solution for building out enterprise-grade blockchain applications at scale.

Fluree is a certified Public Benefit Corporation. As part of our corporate charter, our company’s intended CSR initiatives focus on providing free education, programs, and resources for individuals wishing to start, change, and build their careers. **We believe that society best functions when its people are in control of the work they do and their contributions to the world.** Fluree looks forward to building a future where everyone makes their contribution to society to the fullest extent of their potential, with happiness, passion, work-life-balance, and access to a broad set of resources.

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