Blend in Chicago: MongoDB World 2017

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Blend

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- Tom Schenk, Chief data officer, Chicago. *WindyGrid*.
  - Track colocated data, 911 calls to Tweets to weather.
  - Flexible schema: `{what, when, where}`
  - Predictive analytics (example, where to send food inspector) using visualization of multiple causal layers.
- Dev Ittycheria, CEO MongoDB
  - 2007 is watershed year, AWS, iPhone, Android, and many others.
  - Argue b/c storage costs dropped below a critical point.
  - MongoDB also in 2007: document model, distributed systems + aggregation.

- Eliot Horowitz, CTO, MongoDB
  - 3.6 ships November, already on Github.
  - MongoDB Charts (3.6)
    - Business Intelligence: BI Connector is SQL interface.
    - Coercing data to table is difficult: polymorphic schemas, arrays.
    - Solution: *MongoDB Charts*! Data visualization tool, handles above.
  - 3.6 document model features:
    - `$lookup` takes sub-pipelines!
    - `$update` can operate on arrays natively! Takes a filter over array entries, can iterate over nested.
    - JSON Schemas.
  - 3.6 distributed systems:
    - Native retryable writes
    - *Change Streams* can get a stream of changes to a db.

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- Eliot Horowitz, CTO, MongoDB (continued)
  - Mongo Atlas
    - “Should be irrespensible to run MongoDB in cloud w/o Atlas”
    - Built in security, one-click spin up, built in scaling elasticity.
    - Data browser + performance viewer in UI (utilization stats, examine queries as stream, explore data),
    - Live migration service (not very live in demo, requires downtime for mirror to catch up and change source of truth).
    - Now with MS Azure + Google Cloud support too (+ AWS).

    - Performance Adviser.
    - CRUD support in data browser.
    - Charts!
    - LDAP Auth.
    - Cross-region, cross-cloud!
  - MongoDB Stich (Beta as of today in Atlas, 06/20/17)
    - “Backend as a service”
    - REST API for MongoDB
    - Configuration-based auth/security
    - Service composition to govern how services talk to each other.

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- Nested schema, spectrum of highly normalized or denormed storage.
  - Normalized requires foreign keys, requires looking into many collections.
  - Denorm is simpler query, complex schema.
- Consider three possible behaviors:
  - Get player: Denorm outperforms.
  - Add new field to doc: either add new collection or modify every doc, the same.
  - Change existing field: If a highly shared field, normalized is very fast.

- Optimizing highly normalized:
  - Can optimize with aggregate, but more importantly `db.createView()`.
    - Views are basically stored aggregates.
    - Better `$project` support.
  - Also consider, if reading much more than writing, should store calculated fields!
- Optimizing denormed:
  - Should normalize fields that are infrequently updated.
- `tl;dr` normalized have fast write, slow reads. Should embed everything that is infrequently updated.

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- Axiom: data models maximize performance + scalability despite latency, costs, hardware.
- Common issues #1, too many optional fields:
  - Use attribute array, `[{key: keyName, value}]`.
  - Accommodates optional fields.
- Common issues #2, working set does not fit in RAM.
  - Can subset, truncate data
  - Probably also useful for showing users too.
- Common issues #3, data consistency.
  - Accept instantaneous inconsistency, duplicate at regular intervals ☹.
- Common issues #4, repeated computations
  - Reads generally outnumber writes, apply computation on write.
- Common issues #5, expensive tracking
  - e.g. expensive to increment on every page view
  - Solution: random number in range $[1, N]$, increment by N.
- Common issues #6, large data easily overflow
  - Bucket, store buckets into a separate collection.

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- Microservices vs. monolith, preferable b/c web scale, faster iteration, compartmentalized.
- One common rule of thumb is that one developer can own the whole thing, a couple hundred lines, but not everybody
- Hard metal vs. Docker (Kubernetes) vs. Atlas.
- Kafka can run general events while Mongo streams (the new feature) only handles database updates.