



Contributing to Open Source & etcd Robustness under the Hood

September 11, 2024

Chun-Hung (Henry) Tseng



Chun-Hung (Henry) Tseng

DevOps Engineer in NIKE team at Swisscom

-  **RCLONE** maintainer (ProtonDrive backend)
-  **etcd** project member



Agenda

1. The open-source contribution journey
2. etcd robustness test



The Open-Source Contribution Journey



Fixing NAPTR support #4212

Merged

k8s-ci-robot merged 4 commits into [kubernetes-sigs:master](#) from [jstudler:master](#) on Feb 29

Conversation 8

Commits 4

Checks 9

Files changed 3



jstudler commented on Jan 26 · edited

Contributor ...

Description

This PR fixes NAPTR support for ExternalDNS. ExternalDNS [prevents you from using trailing dots in the target](#). However, NAPTR requires trailing dots according to RFC (<https://datatracker.ietf.org/doc/html/rfc2915>). The check for illegal target in crd.go is adjusted so that it's inverted for NAPTR records to match the RFC2915.

Further Reading:

- <https://serverfault.com/questions/748329/naptr-records-in-dns-bind>
- <https://www.transip.eu/knowledgebase/entry/4876-setting-a-naptr-record>

Fixes [#3979](#)

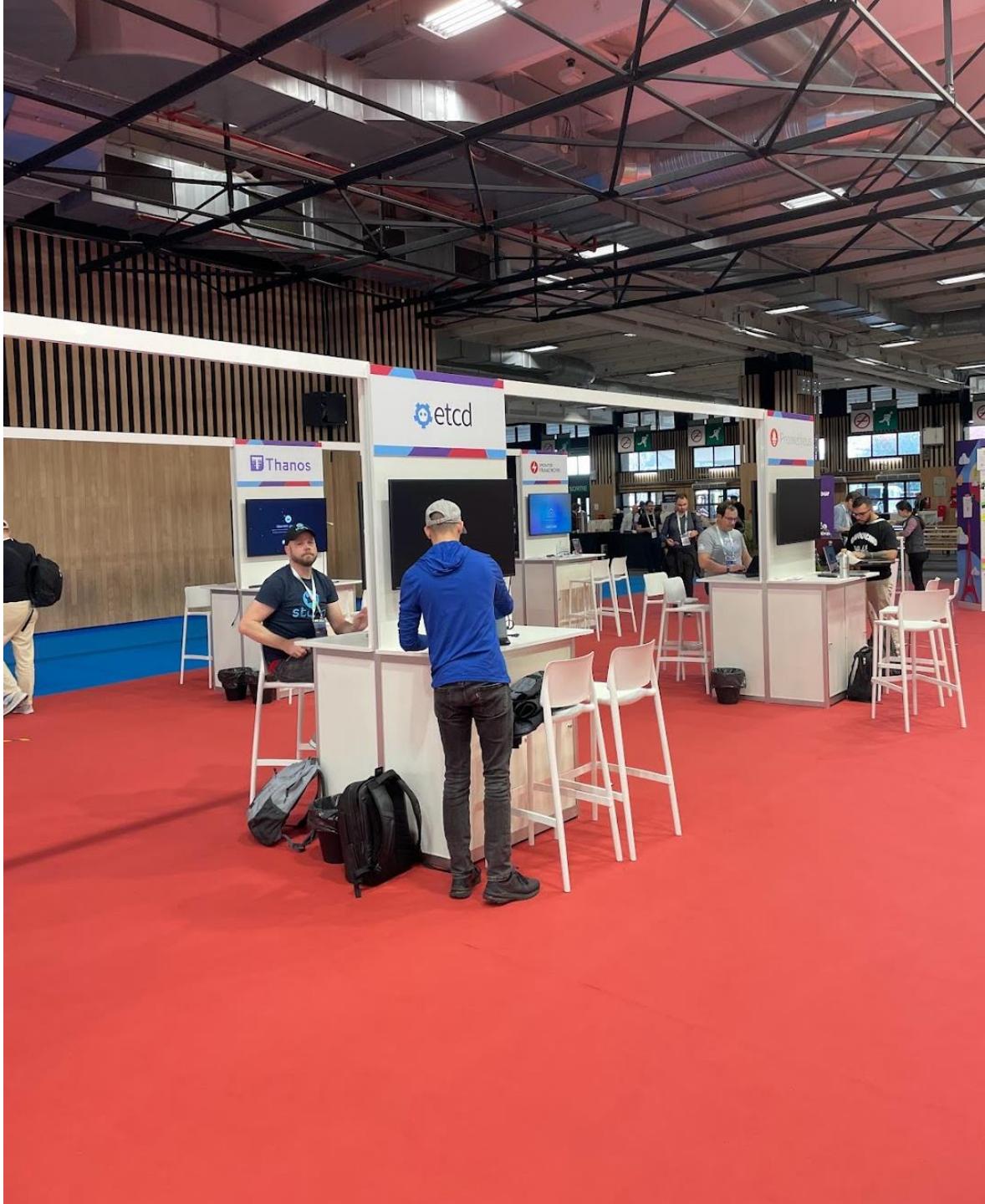
Checklist

- Unit tests updated
- End user documentation updated



KubeCon Paris 2024

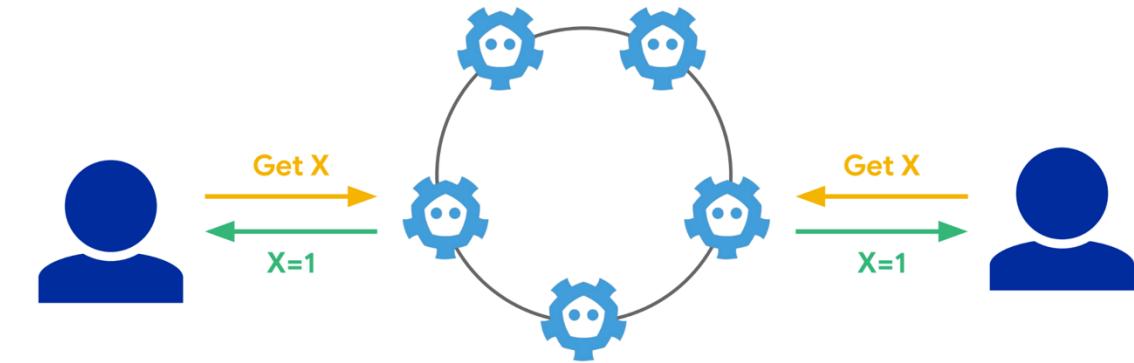
Project Pavilion





What's etcd?

- A distributed and reliable key-value store for the most critical data of a distributed system (e.g. Kubernetes cluster)
- Written in golang
- Based on projects such as raft, bbolt, gofail, auger, etc. that are maintained by the etcd org



CNCF COMMUNITY MEETINGS

[ADD TO YOUR GOOGLE CAL](#)

Want to add your event to the CNCF calendar?

Please [contact us](#).

X < 09/11/24 > Agenda Monthly CALENDAR

Sep - Oct 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	8	9	10	11	12	13
		Notary Project Community Meeting	CNCF Distribution Project Meeting	CNCF ORAS Project Meeting	Thanos Contributor Hours	CNCF Chaos Engineering WG
		CLOMonitor Office Hours	CNCF Compliance Working Group	CNCF TAG Observability APAC Monthly Meeting	CNCF TAG Environmental Sustainability WG Comms Weekly Meeting	CNCF Zero Trust Paper [Security TAG]
		Prometheus Contributor Hours	CNCF Tinkerbell Community Meeting	Kube-OVN Community Meeting	KubeVirt SIG - Performance & Scale	Cloud Native AI Working Group
		Operator SDK's Issue Triage Meeting	CNCF TAG App Delivery: Platforms Working Group	CNCF CubeFS Community Meeting	CNCF Serverless Workflow Weekly Meeting	Jaeger Project Bi-Weekly Call
			CNCF WASM Working Group	CNCF Flux Project Meeting	[EMEA] CNCF TAG-Security Bi-Weekly Meeting	Higher Ed Monthly Meeting Cloud Native Curriculum
			KEDA Community Standup	KubeVirt Community Weekly Meeting	CNCF TAG Security - Supply Chain WG	CNCF TAG App Delivery - WG Artifacts Meetings
			Network service mesh WG call - ZOOM conference call	Metal3 Community Meetings	CNCF TAG Security - Supply Chain WG	
			TAG Observability Query Standard Working Group Meeting	CNCF TAG Security — Baseline WG	containerd Community Meeting	
			CNCF Artifact Hub Project Meeting	Cooperative Delivery WG Meeting	CNCF TAG-Network Meeting	
			SPIRE Contributor Sync	CNCF Kubernetes Policy WG Team Meeting	CNCF Serverless WG Meeting	
				CNCF Storage TAG Meeting (2nd Wed)	Kubewarden Community Monthly Meeting	
					Notary Project Community Meeting	
					OpenFGA Monthly	



Bi-weekly triage and community meetings

- Meet the maintainers and active members
- See past discussions on various topics in the meeting notes
- Understand the project roadmap, current focus, ongoing issues, etc.

Discover Opportunities!

The screenshot shows a Google Slides slide with the following content:

SIG-etcd community and triage meeting

On Thu, 11am PT on <https://zoom.us/mly/cncfetcdproject> (493047233), passcode: <https://github.com/etcd-io/etcd/pull/1393>
Join <https://groups.google.com/g/etcd-dev> to get calendar invite and edit access

About

On Thursdays, the SIG-etcd community holds two alternating meetings:

- **Community Meeting:** An open forum where the community can discuss any topic related to etcd.
- **Triage meeting:** A session where the community collaboratively reviews and assigns GitHub issues and pull requests.

Additionally, every second Wednesday there is a

- Robustness test regular meeting (Public)

We welcome you updating these Google documents with proposed meeting agenda items!

Next topics to discuss

- [jmhbnz] Spreadsheet is up for etcd booth team for KubeCon NA 2024
■ etcd Kiosk Utah 2024 . If you are keen to help please put your name down, look forward to seeing you there!

Sep 12, 2024 - Triage meeting - Next meeting

kubernetes/kubernetes

-
- etcdo/etcd
-

Sep 5, 2024 - Community meeting - <Recording Link>

- [github username] Agenda item to discuss
- Release planning
 - 3.4: <https://github.com/etcd-io/etcd/issues/18486>
 - Lead: Ivan
 - Shadow: Henry
 - Advisor: Benjamin
 - 3.5: <https://github.com/etcd-io/etcd/issues/18485>
 - Lead: Ivan
 - Shadow: Arka
 - Advisor: James
 - Tentative release date: next week
 - Any preference on which one to go out first?
 - Benjamin: 3.5 first
 - James: we have a new release team with release access, it currently is staffed with maintainers + reviewers, but we want to grow that team, reach out James if you are interested in joining the team, however this is limited to reviewer role or higher currently. Thanks to Ivan for volunteering to lead our next two releases!
- [Benjamin] Good opportunity for community to learn diff of serializability vs. linearizability: https://github.com/etcd-io/etcd/discussions/18521#discussion_comment-10519065



GitHub Issue Tracker

Filter by

- <> Code 0
- Repositories 0
- Issues 104**
- Pull requests 0
- Discussions 0
- Users 0
- More

State

- Open
- Closed**

Advanced

- Owner
- State
- Close reason
- Has linked pull request
- Author
- Assignee
- Mentioned user
- Mentioned team

104 results (132 ms) in **etcd-io** X

Sort by: Best match ▾ Save ⋮

etcd-io/etcfd

Need to update golang pkg.dev document

Bug report criteria - [X] This bug report is not security related, security issues should be disclosed privately via etcd maintainers. - [X] This is not a support request or question, support requests ...

[area/documentation](#) [help wanted](#) [type/cleanup](#)

 ah8ad3 · 4 · Opened on Aug 6 · #18410

etcd-io/etcfd

Add hashKV checking to robustness test

What would you like to be added? <https://github.com/etcd-io/etcd/pull/18274> proposes to change very delicate part of compaction to fix a correctness bug. There is high concern in this change potentially ...

[area/robustness-testing](#) [help wanted](#) [priority/important-soon](#) [type/feature](#)

 serathius · 8 · Opened on Jul 31 · #18386

etcd-io/etcfd

Reduce log spam on missing member

What would you like to be added? { level : warn , ts : 2024-06-27T07:54:41.820665Z , caller : rafthttp/peer.go:267 , msg : dropped internal Raft message since sending buffer is full (overloaded network) ...

[area/observability](#) [help wanted](#) [priority/backlog](#) [priority/important-longterm](#) [type/bug](#)

 davhdav · 8 · Opened on Jun 27 · #18238



Learn how you can use GitHub Issues to plan and track your work.

Save views for sprints, backlogs, teams, or releases. Rank, sort, and filter issues to suit the occasion. The possibilities are endless.

[Learn more about GitHub Issues →](#)

How can we improve search? [Give feedback](#)

💡 **ProTip!** Press the key to activate the search input again and adjust your query.



“

Right expectations

”



“

Don't drop PRs and disappear

”



Weekly Dependency Update

- Updating dependencies
 - **Dependabot** can't handle multiple go mod files in a project gracefully
 - **CI automation improvements**, e.g. dependency version consistency check, etc.
- Update go toolchain versions
 - CI images and pipeline (**prow**) might also be affected
 - Blown-away by all automation **scripts**, e.g. checking the go toolchain version consistency

The screenshot shows a GitHub search interface with the following filters applied:

- Filters: is:pr author:henrybear327 is:closed
- Labels: 64
- Milestones: 3
- New pull request button

The search results show 49 closed pull requests. The first three results are summarized below:

- [2024-09-03] Bump dependency updates identified by dependabot ✓ approved
area/clientv3 area/etcddt1 area/etcddt1 area/testing area/tooling size/L
#18536 by henrybear327 was merged last week
- [2024-08-29] Bump dependency updates identified by dependabot ✓ approved
area/clientv3 area/etcddt1 area/etcddt1 area/testing area/tooling size/L
#18515 by henrybear327 was merged last week
- [2024-08-24] Bump dependency updates identified by dependabot ✓ approved
area/clientv3 area/etcddt1 area/etcddt1 area/testing area/tooling size/L
#18490 by henrybear327 was merged 2 weeks ago



Backporting Fixes

- Multiple maintained versions
- Not easy as code structures might have changed drastically across versions

Author	Label	Milestones	Reviews	Assignee	Sort
henrybear327	[backport-3.4] server: ignore raft messages if member id mismatch	ok-to-test	3		
henrybear327	[backport-3.5] server: ignore raft messages if member id mismatch	ok-to-test	4		
henrybear327	Backport initialization of epMu in NewCtxClient to release-3.4	ok-to-test	3		
henrybear327	Backport initialization of mu in NewCtxClient to release-3.5	ok-to-test	3		



Triage Issues Happy Debugging

- Investigating root causes
 - Good way to enhance your understanding of the codebase and how to use the debugging / testing toolchain
- Put in proper code changes
 - Unknown use cases to you
 - Break tests / debug flaky tests / etc.
- Selling it to the reviewers
 - What is the right approach to solving bugs?

Blackhole failpoint in the proxy does not block all updates
[#17737](#)

[Open](#) 4 tasks done siyuanfoundation opened this issue on Apr 8 · 15 comments

siyuanfoundation commented on Apr 8 · edited Member ...

Bug report criteria

This bug report is not security related, security issues should be disclosed privately via [etcd maintainers](#).

This is not a support request or question, support requests or questions should be raised in the etcd [discussion forums](#).

You have read the etcd [bug reporting guidelines](#).

Existing open issues along with etcd [frequently asked questions](#) have been checked and this is not a duplicate.

What happened?

When mocking a network partition in e2e test with the `proxy.BlackholeTx()` and `proxy.BlackholeRx()`, the partitioned follower node can still receive all the write updates happening during that blackhole period.

When the partitioned node was the original leader, new write updates are not applied to the partitioned node.

This bug makes the reliability of existing tests depending on this failpoint questionable.

What did you expect to happen?

The blackhole failpoint should drop all packets sent to the partitioned node, and it should not receive any write updates happening during that blackhole period.

How can we reproduce it (as minimally and precisely as possible)?

#17736

```
cd tests/e2e
go test -run TestBlackholeByMockingPartitionFollower -v
```

Anything else we need to know?

No response

Etcd version (please run commands below)

▶ Details

Etcd configuration (command line flags or environment variables)

▶ Details

Etcd debug information (please run commands below, feel free to obfuscate the IP address or FQDN in the output)

▶ Details

Assignees
henrybear327 — unassign me

Labels
[help wanted](#) [type/bug](#)

Milestone
No milestone

Development
No branches or pull requests

Notifications
[Unsubscribe](#)
You're receiving notifications because you're watching this repository.

5 participants

Status: Open



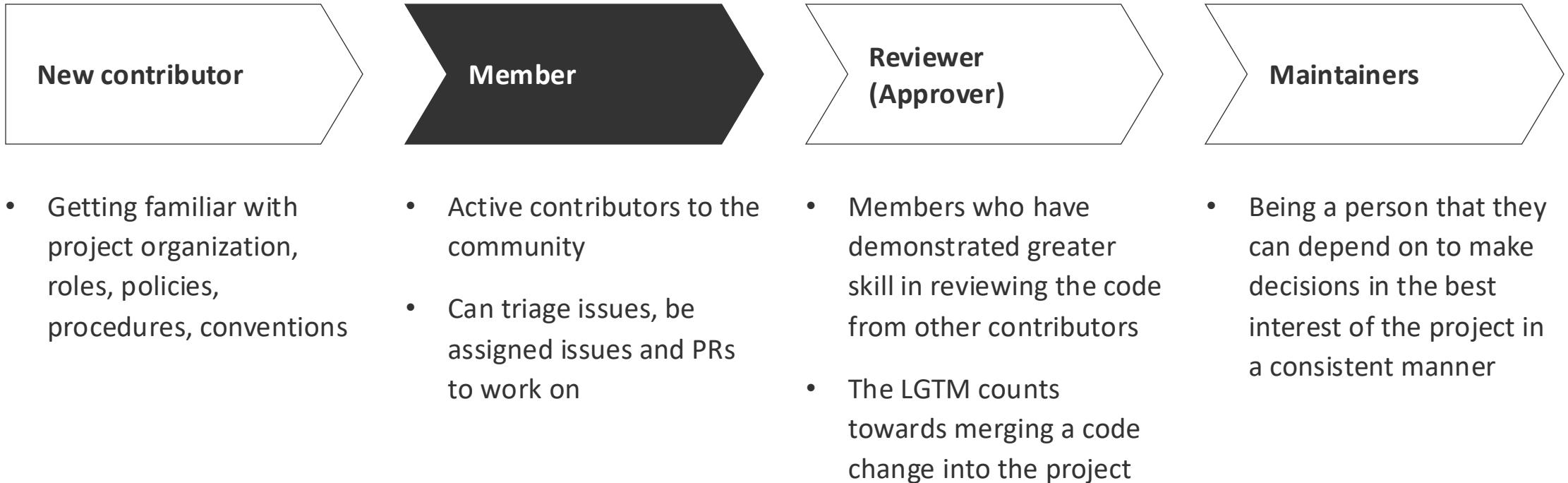
- [Release Signoff Checklist](#)
- [Summary](#)
- [Motivation](#)
 - [Goals](#)
 - [Non-Goals](#)
- [Proposal](#)
 - [User Stories \(Optional\)](#)
 - [Story 1](#)
 - [Story 2](#)
 - [Notes/Constraints/Caveats \(Optional\)](#)
 - [Is feature enablement state a server level or cluster level property?](#)
 - [Is feature gate a replacement of boolean flags?](#)
 - [Should we use feature gate for bug fixes?](#)
 - [Could the lifecycle of a feature change in patch versions?](#)
 - [Risks and Mitigations](#)
- [Design Details](#)
 - [Feature Gate](#)
 - [Ways to Query Feature Gate State](#)
 - [Feature Stages](#)
 - [Path to Migrate Existing Experimental Features](#)
 - [Test Plan](#)
 - [Prerequisite testing updates](#)
 - [Unit tests](#)
 - [Integration tests](#)
 - [e2e tests](#)
 - [Graduation Criteria](#)
 - [Milestone 1](#)
 - [Milestone 2](#)
 - [Milestone 3](#)
 - [Upgrade / Downgrade Strategy](#)
 - [Version Skew Strategy](#)
- [Implementation History](#)
- [Drawbacks](#)
- [Alternatives](#)

Ongoing Contributions

- Server/cluster-level feature gate KEP
 - Speaking volume of the design document is **HUGE**
 - Shadow the releases
 - Understand the release criteria, process, etc.
 - Triaging issues and more debugging

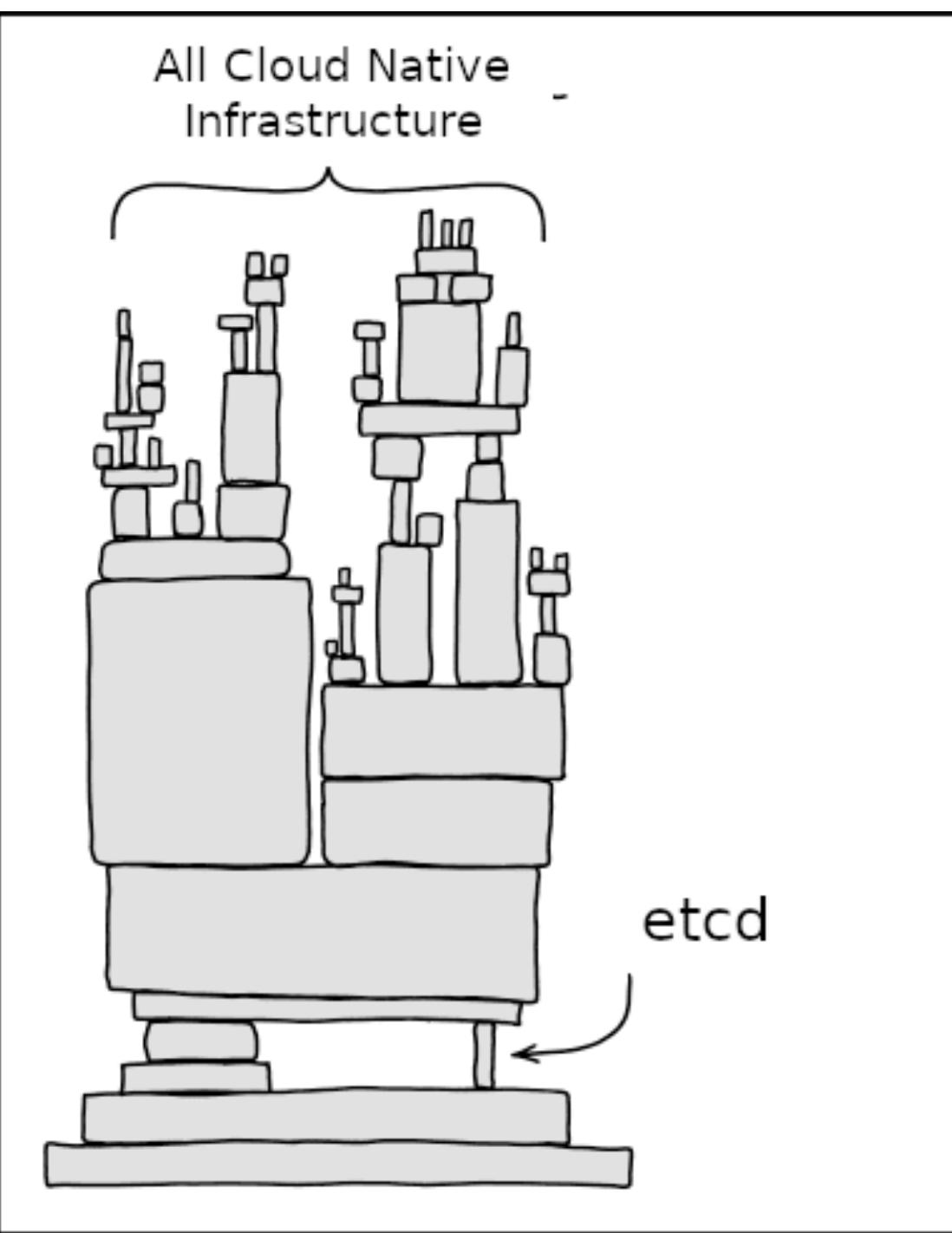


Community Membership (etcd)





etcd Robustness Test





v3.5 Data Inconsistency Bug

Summary

Summary	Code refactor in v3.5.0 resulted in consistent index not being saved atomically. Independent crash could lead to committed transactions are not reflected on all the members.
Impact	No user reported problems in production as triggering the issue required frequent crashes, however issue was critical enough to motivate a public statement. Main impact comes from loosing user trust into etcd reliability.



Robustness Test – on the Hunt for Data Inconsistency

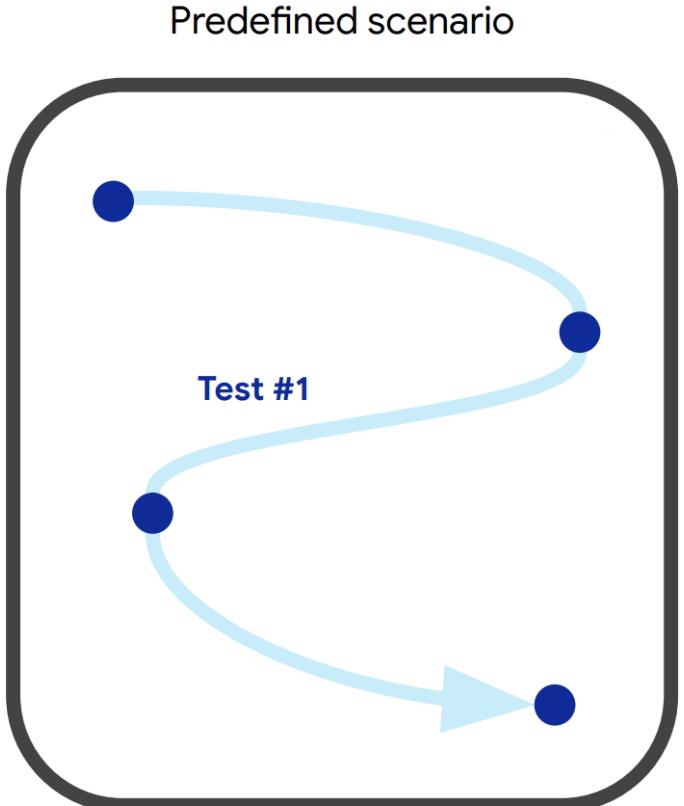
- How to ensure we have confidence in our code changes?
- How to detect potential issues before it surfaces on Kubernetes?
- KubeCon talk: On the Hunt for Etcd Data Inconsistencies by Marek Siarkowicz, Google





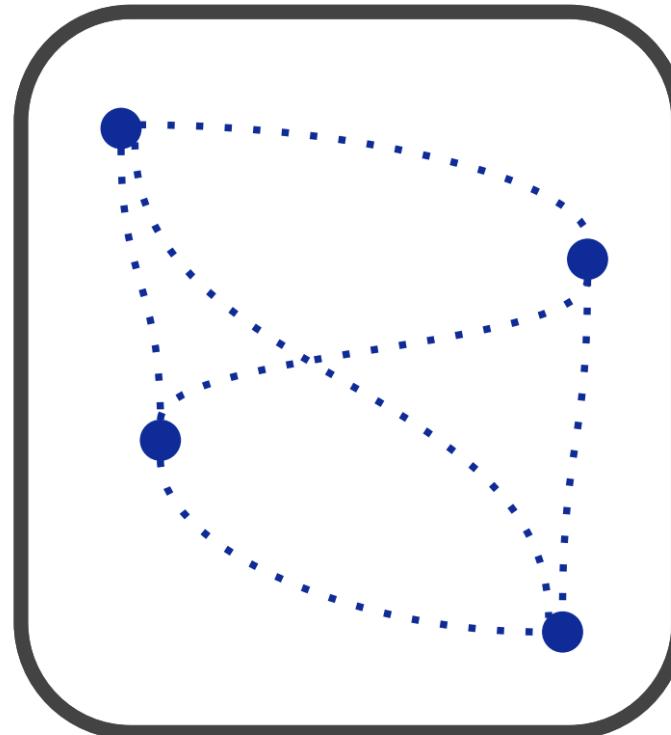
Why Not Just Use Unit/Integration Tests?

Chun-Hung (Henry) Tseng, C2 general



Validation at the end by comparing result vs expect

Defining possible paths and picking random



Validation ??



Past Approach and Industry State-of-the-Art

Etcd functional tests

Framework built by previous maintainers to address the identical problem – generating traffic on the etcd cluster while injecting failures, and validating if cluster members are inconsistent

Problems

- Very rigid and over-engineered
- Flaky

Jepsen

State-of-the-art and generic framework built to validate the safety and correctness of distributed systems, such as database, queues, consensus systems, etc.

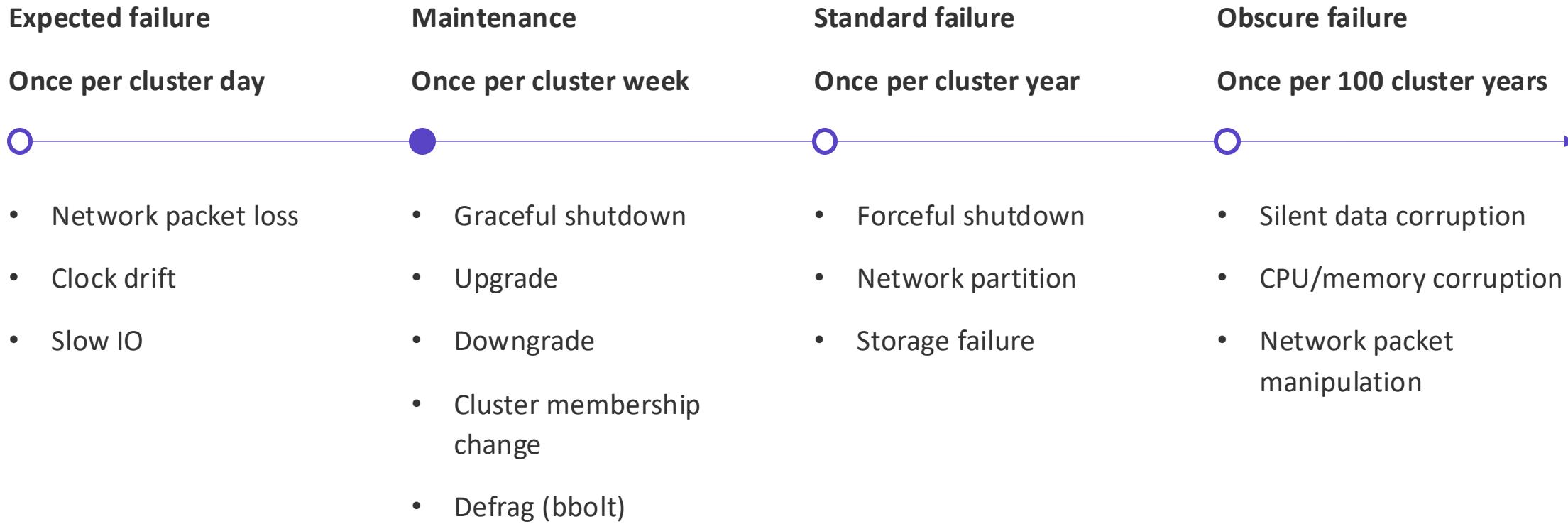
Developed by Kyle Kingsbury

Problems

- Written in Closure
- Not designed for CI and nightly run
- Not approachable and requires deep domain knowledge



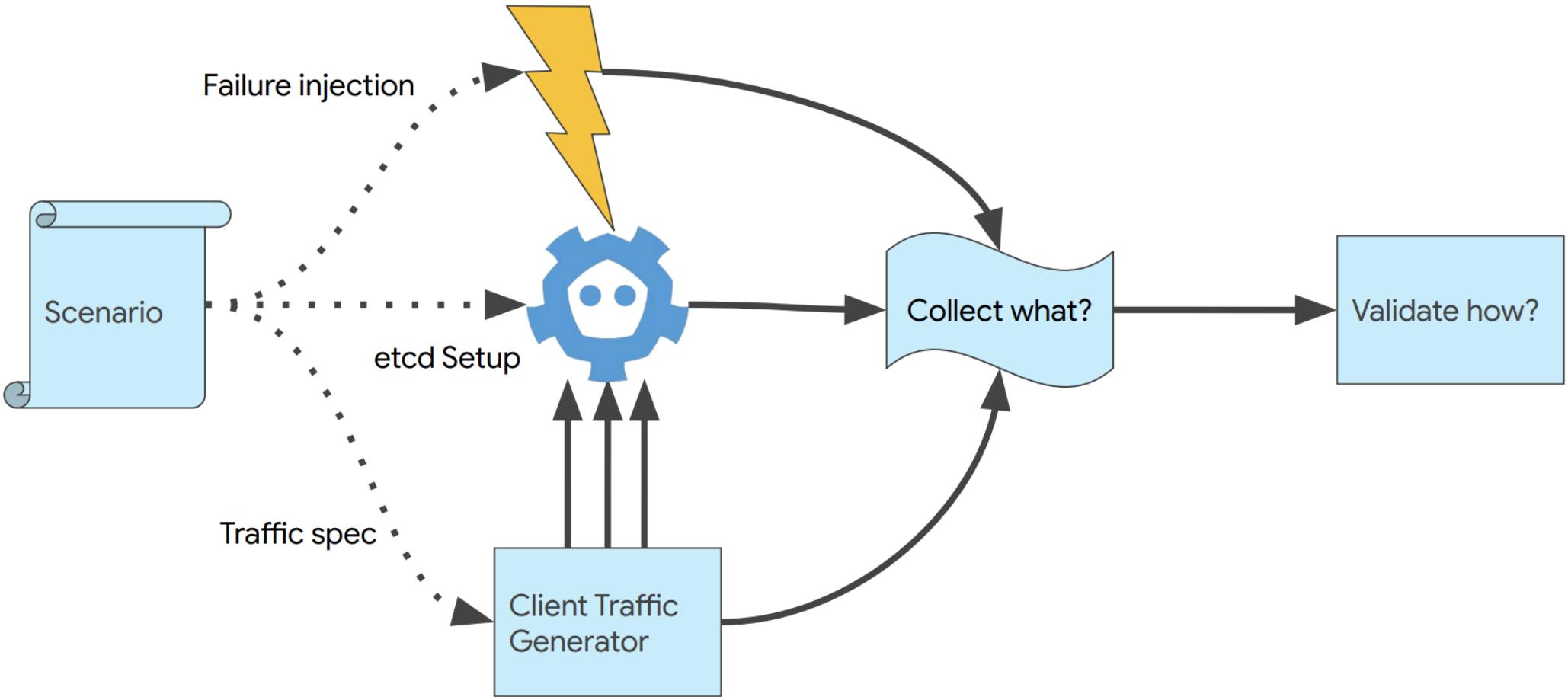
Design Consideration – Failure Scenarios





Validation???

Chun-Hung (Henry) Tseng, C2 general





Missing Piece 1: Model-Based Testing

- Uses a model to find discrepancies in real system behavior
- A model
 - Represents the **desired behavior** of the system
 - Is a **simplified implementation** of a real system
 - Implements **subset of API** that we want to test
- Model-based tests take an **operation history** executed by the system and **replay** it on the model
 - Test passes if their responses match
- As a **key-value store etcd model can be just a hash map** with a counter to simulate revision.

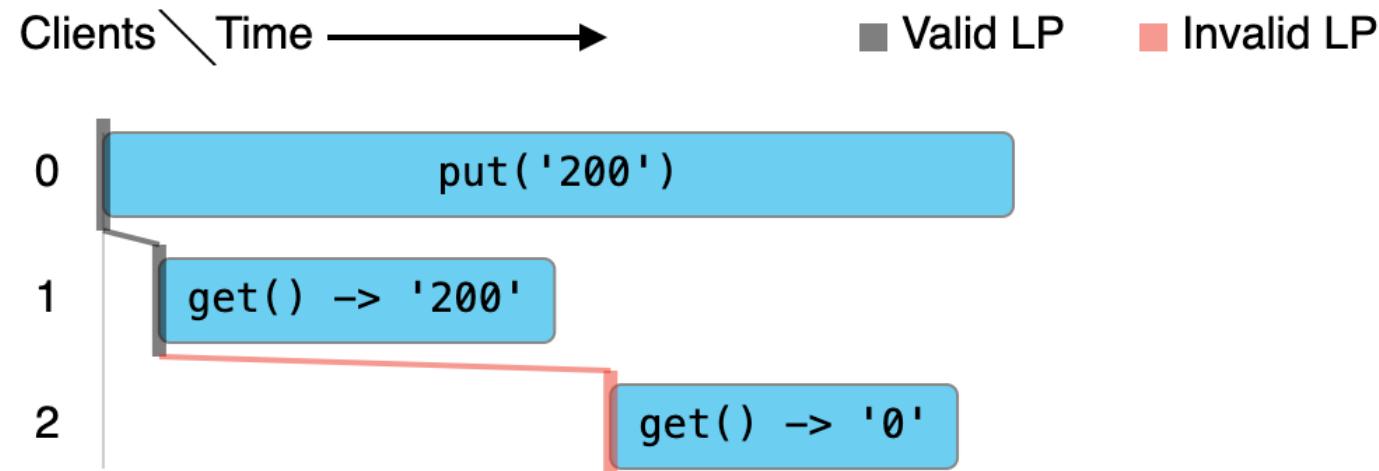


Missing Piece 2: Porcupine

- A fast linearizability checker
- It takes a sequential specification as executable Go code, along with a concurrent history, and it determines whether the history is linearizable with respect to the sequential specification.

Now, suppose we have another history:

```
C0: |----- put('200') -----|  
C1: |- get() -> '200' -|  
C2: |----- get() -> '0' -|
```





Missing Piece 3: Gofail

- Add code points where errors may be injected in a user-controlled fashion

```
func someFunc() string {
    // gofail: var SomeFuncString string
    // // this is called when the failpoint is triggered
    // return SomeFuncString
    return "default"
}
```

```
func someFunc() string {
    if vSomeFuncString, _fpErr := __fp_SomeFuncString.Acquire()
        // this is called when the failpoint is triggered
        return SomeFuncString; goto __nomockSomeFuncString;
    return "default"
}
```

etcd-io / gofail

Type ⌂ to search

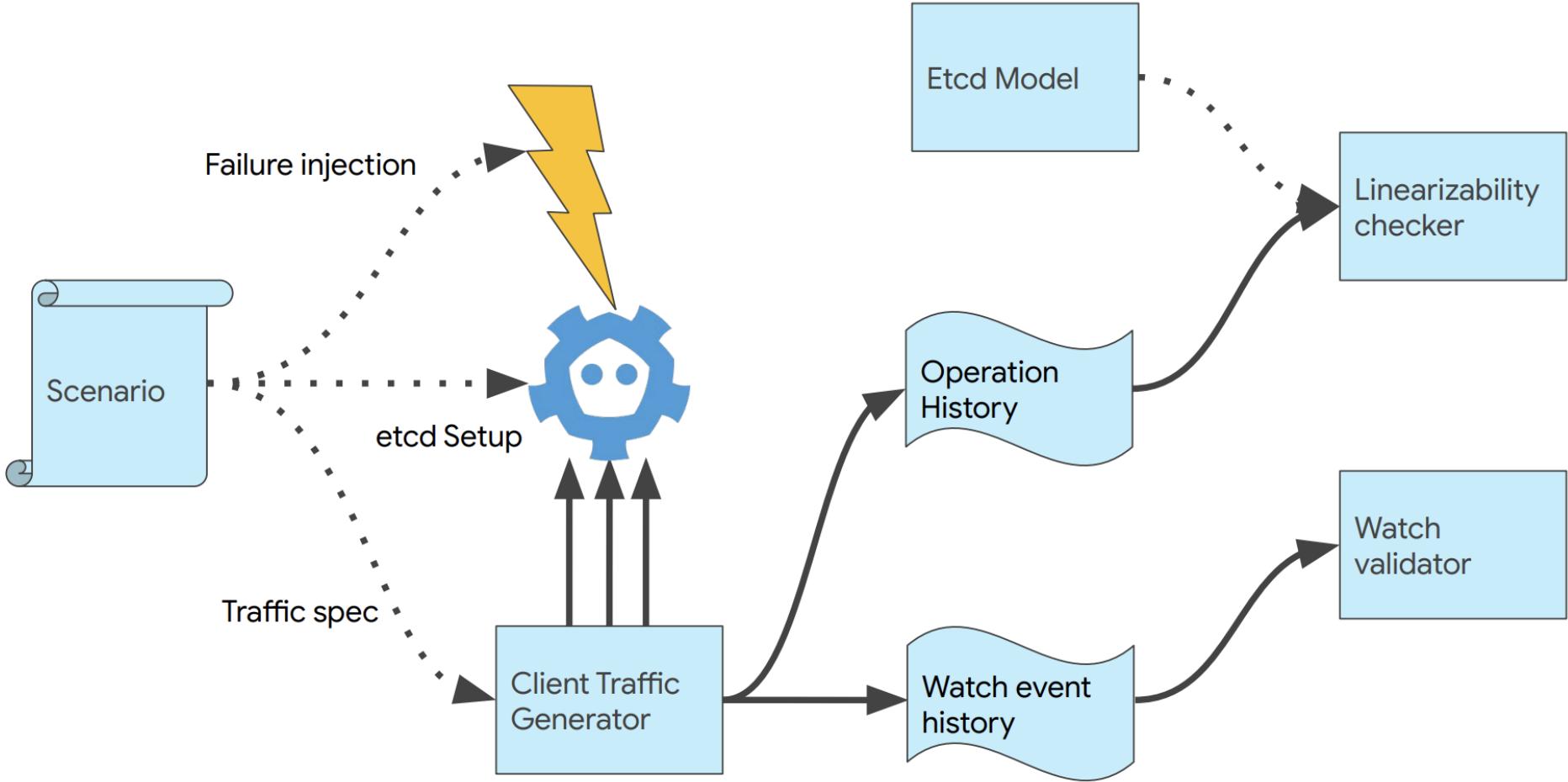
Code Issues 2 Pull requests 1 Actions Security Insights

Merged ahrtr merged 1 commit into etcd-io:master from henrybear327:owner/add_henrybear327 4 hours ago



```
if len(keys) < batchNum {
    // gofail: var compactBeforeSetFinishedCompact struct{}
    UnsafeSetFinishedCompact(tx, compactMainRev)
    tx.Unlock()
    // gofail: var compactAfterSetFinishedCompact struct{}
    hash := h.Hash()
    size, sizeInUse := s.b.Size(), s.b.SizeInUse()
    s.lg.Info(
        "finished scheduled compaction",
        zap.Int64("compact-revision", compactMainRev),
        zap.Duration("took", time.Since(totalStart)),
        zap.Uint32("hash", hash.Hash),
        zap.Int64("current-db-size-bytes", size),
        zap.String("current-db-size", humanize.Bytes(uint64(size))),
        zap.Int64("current-db-size-in-use-bytes", sizeInUse),
        zap.String("current-db-size-in-use", humanize.Bytes(uint64(sizeInUse))),
    )
    return hash, nil
}

tx.Unlock()
// update last
last = RevToBytes(Revision{Main: rev.Main, Sub: rev.Sub + 1}, last)
// Immediately commit the compaction deletes instead of letting them accumulate in the write buffer
// gofail: var compactBeforeCommitBatch struct{}
s.b.ForceCommit()
// gofail: var compactAfterCommitBatch struct{}
dbCompactionPauseMs.Observe(float64(time.Since(start) / time.Millisecond))
```





Project Impact

- Issues detected
 - Revision inconsistency caused by panic during defrag #14685
 - Watch response traveling back in time after network partition #15271
 - Duplicate event revision on watch stream #15248



Bi-weekly Meeting to Debug Together

sig-etcd sig-etcd-amd64 sig-etcd-arm64 sig-etcd-presubmits sig-etcd-periodics sig-etcd-postsubmits **sig-etcd-robustness** sig-etcd-etcd-manager
sig-etcd-website-presubmits

Summary ci-etcd-robustness-main-amd64 ci-etcd-robustness-main-arm64 ci-etcd-robustness-release35-amd64 ci-etcd-robustness-release35-arm64
ci-etcd-robustness-release34-amd64 ci-etcd-robustness-release34-arm64 pull-etcd-robustness-amd64 pull-etcd-robustness-arm64

Show All Alerts Hide All Alerts Sort by Status

✗	ci-etcd-robustness-main-amd64: FLAKY Tab stats: 7 of 9 (77.8%) recent columns passed (1910 of 1921 or 99.4% cells)	Last update: 09-10 21:29 CEST Tests last ran: 09-10 20:28 CEST Last green run: 42dd29877
✓	ci-etcd-robustness-main-arm64: PASSING Tab stats: 10 of 10 (100.0%) recent columns passed (2147 of 2147 or 100.0% cells)	Last update: 09-10 21:35 CEST Tests last ran: 09-10 09:54 CEST Last green run: 4997a2bf9
✗	ci-etcd-robustness-release35-amd64: FLAKY Tab stats: 9 of 10 (90.0%) recent columns passed (1407 of 1411 or 99.7% cells)	Last update: 09-10 21:54 CEST Tests last ran: 09-10 10:14 CEST Last green run: 4997a2bf9
✓	ci-etcd-robustness-release35-arm64: PASSING Tab stats: 10 of 10 (100.0%) recent columns passed (1400 of 1400 or 100.0% cells)	Last update: 09-10 21:33 CEST Tests last ran: 09-10 09:55 CEST Last green run: 4997a2bf9
✓	ci-etcd-robustness-release34-amd64: PASSING Tab stats: 10 of 10 (100.0%) recent columns passed (1230 of 1230 or 100.0% cells)	Last update: 09-10 21:54 CEST Tests last ran: 09-10 10:14 CEST Last green run: 4997a2bf9
✗	ci-etcd-robustness-release34-arm64: FLAKY Tab stats: 9 of 10 (90.0%) recent columns passed (1226 of 1230 or 99.7% cells)	Last update: 09-10 21:32 CEST Tests last ran: 09-10 09:55 CEST Last green run: 4997a2bf9
✗	pull-etcd-robustness-amd64: FLAKY Tab stats: 9 of 10 (90.0%) recent columns passed (1026 of 1027 or 99.9% cells)	Last update: 09-10 21:41 CEST Tests last ran: 09-10 21:10 CEST



09-10 20:28 CEST @1833573014424260608 -- 08-27 20:25 CEST @1828499102732652544; Served 2988 results in 0.17 seconds

	09-10	09-09	09-08	09-07	09-05	09-04	09-03	09-02	09-01
	20:28 CEST	20:31 CEST	20:27 CEST				20:26 CEST		
	1833573014424260608	183321062...	183284823...	183248583...	183176082...	183139843...	183103604...	183067365...	183067365...
	4997a2bf9	42dd29877	f89dfed2d	bf63f9170	4a11ca6c8	c00593bbd	4bb...	4bb...	4bb...
cd-robustness-main-amd64.Overall									
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory	120/120	120/120	119/120	120/120	120/120	116/120	120/120	120/120	120/120
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3	120/120	120/120	119/120	120/120	120/120	116/120	120/120	120/120	120/120
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/MemberReplace	9/9	5/5	4/5	4/4	7/7	3/3	2/2	4/4	2/2
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/Kill	4/4	3/3	3/3	7/7	6/6	3/4	4/4	10/10	3/3
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/beforeApplyOneConfChange	3/3		5/5		2/2	4/5			3/3
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/blackholePeerNetwork	8/8	7/7	8/8	6/6	6/6	8/9	4/4	7/7	6/6
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/raftAfterSave=sleep(1s)	5/5	6/6	4/4	5/5	3/3	5/6	2/2	6/6	7/7
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/raftBeforeSaveSnap=panic	6/6		2/2	3/3	5/5	4/4	2/2	3/3	3/3
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/KubernetesHighTraffic/ClusterOfSize1	120/120	120/120	120/120	120/120	120/120	120/120	120/120	120/120	120/120
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize3/beforeWritebackBuf=panic		6/6	7/7	4/4	3/3	5/5	6/6	5/5	5/5
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/KubernetesHighTraffic/ClusterOfSize1/afterWritebackBuf=panic	5/5	2/2		6/6	10/10	5/5	7/7	5/5	2/2
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/KubernetesLowTraffic/ClusterOfSize3	120/120	120/120	120/120	120/120	120/120	120/120	120/120	120/120	120/120
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/KubernetesLowTraffic/ClusterOfSize3/raftAfterSave=sleep(1s)		5/5	8/8	6/6	5/5	4/4	7/7	5/5	6/6
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/KubernetesHighTraffic/ClusterOfSize1/afterStartDBTxn=panic	5/5	10/10	9/9	2/2	4/4	5/5	6/6	4/4	8/8
cd-robustness-main-amd64.Pod									
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1	120/120	120/120	120/120	120/120	120/120	120/120	120/120	120/120	120/120
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/Kill	7/7	9/9	5/5	9/9	4/4	4/4	8/8	7/7	6/6
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/afterCommit=panic()	4/4	5/5	4/4	5/5	14/14	3/3	5/5	6/6	2/2
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/afterStartDBTxn=panic()	8/8	2/2	5/5	9/9	3/3	6/6	7/7	5/5	5/5
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/afterWritebackBuf=panic()	10/10	7/7	6/6	4/4	7/7	6/6	5/5		7/7
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/beforeCommit=panic()	7/7	3/3	11/11	4/4	4/4	6/6	2/2	10/10	5/5
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/beforeSendWatchResponse	5/5	4/4	5/5	4/4	5/5	6/6	6/6	7/7	2/2
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/beforeStartDBTxn=panic()	5/5	6/6	5/5	3/3	9/9	6/6	7/7	10/10	3/3
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/beforeWritebackBuf=panic	7/7	7/7	2/2	4/4	4/4	3/3	8/8	5/5	9/9
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/commitAfterPreCommitHook	8/8	7/7	3/3	7/7	9/9	4/4	4/4	7/7	5/5
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/commitBeforePreCommitHook	3/3	2/2	8/8	5/5	4/4	7/7	7/7	6/6	5/5
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/compactAfterCommitBatch	4/4		3/3	2/2			2/2	2/2	3/3
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/compactAfterCommitSchedule	3/3	3/3	8/8	7/7	4/4	7/7	10/10	2/2	6/6
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/compactAfterSetFinishedCommit	8/8	8/8	7/7	5/5	4/4	9/9	9/9	6/6	11/11
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/compactBeforeCommitBatch	5/5	4/4	3/3	5/5			2/2		2/2
tcfd.io/etcfd/tests/v3/robustness.TestRobustnessExploratory/EtcdHighTraffic/ClusterOfSize1/compactBeforeCommitSchedule	6/6	5/5	5/5	3/3	3/3	7/7	2/2	9/9	4/4



“

Just do it!

”

Questions & Answers

- No boring tasks as you will always learn something
- Apply the learning to the day job
- Technical skill growth

- Thanks to Ashan and Joel for supporting my journey
- Join us at NetBox-Operator! We also welcome contributions there! :D
- Reach out to Alex, Joel, or Ashan if interested!