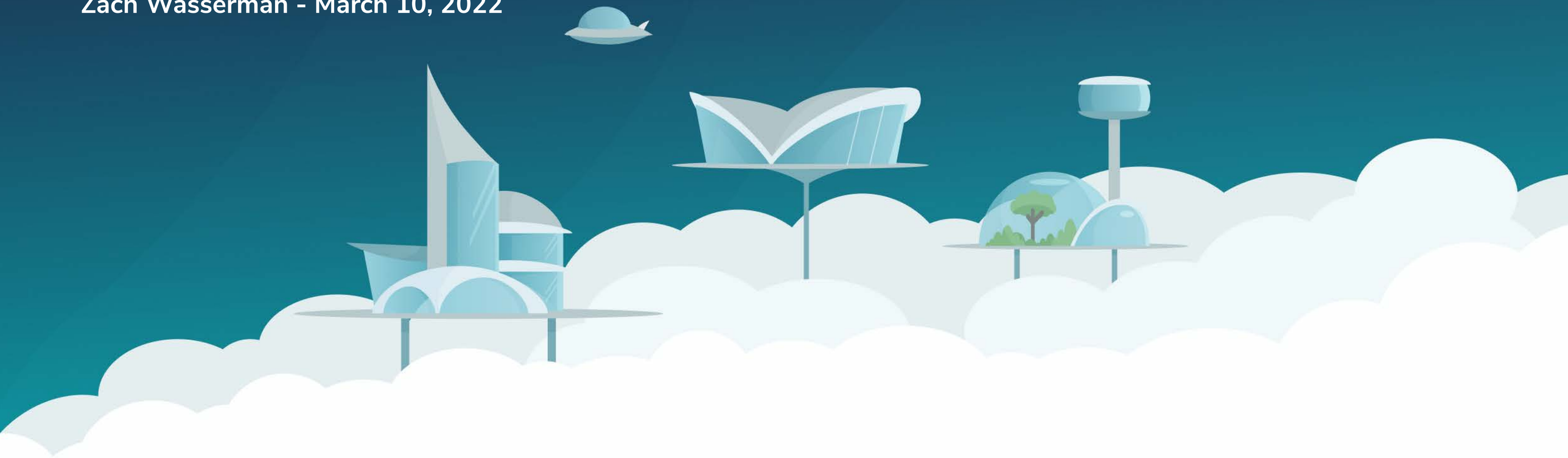
Zach Wasserman - March 10, 2022



Glitches in the Matrix, Or Taming Agent Chaos

Conf42 Chaos Engineering 2022

fleet

Performant endpoint visibility

Transform your OS into a virtual database.

- Developed at Facebook, now a project of the Linux Foundation.
- Open source (MIT License) - github.com/osquery/osquery
- Cross platform - macOS, Windows, Linux, BSD (limited).
- Read only - limited by design.
- Agent deployed across all endpoints (production, corporate, workstations) for security, IT, or operations use cases.

Open source device management

Deploy and manage osquery on 100,000+ devices.

- Open core (MIT/Proprietary License) - github.com/fleetdm/fleet
- Linux server + cross platform CLI tool (fleetctl).
- Two classes of client:
  - Osquery agents - Retrieving configurations, sending collected data.
  - API clients - Humans (or scripts) modifying configurations or retrieving data.

Engineering Resilience

Engineering Resilience

Focus

- Identify areas of key risk, apply mitigations focused to those areas.
- Availability > Integrity > Cost (to some extent)
- Pareto Principle/Amdahl's law
    - Focus on the greatest contributors to risk.

Osquery (Agent)

Production availability
+
Workstation usability
+
Monitoring integrity
+
Compute cost
=
High Risk

Fleet (Server)

Monitoring availability
+
Monitoring latency
+
Monitoring integrity
+
Compute cost
=
Medium Risk

Osquery

Watchdog

- Dual process worker/watcher model.
- Osquery self-watches for CPU and memory utilization, terminating any query that exceeds the set utilization limits, and blocking that query for 24 hours.
- Mitigates:
  - Production availability.
  - Workstation usability.
- Downside: Blocking queries reduces monitoring integrity.

Osquery

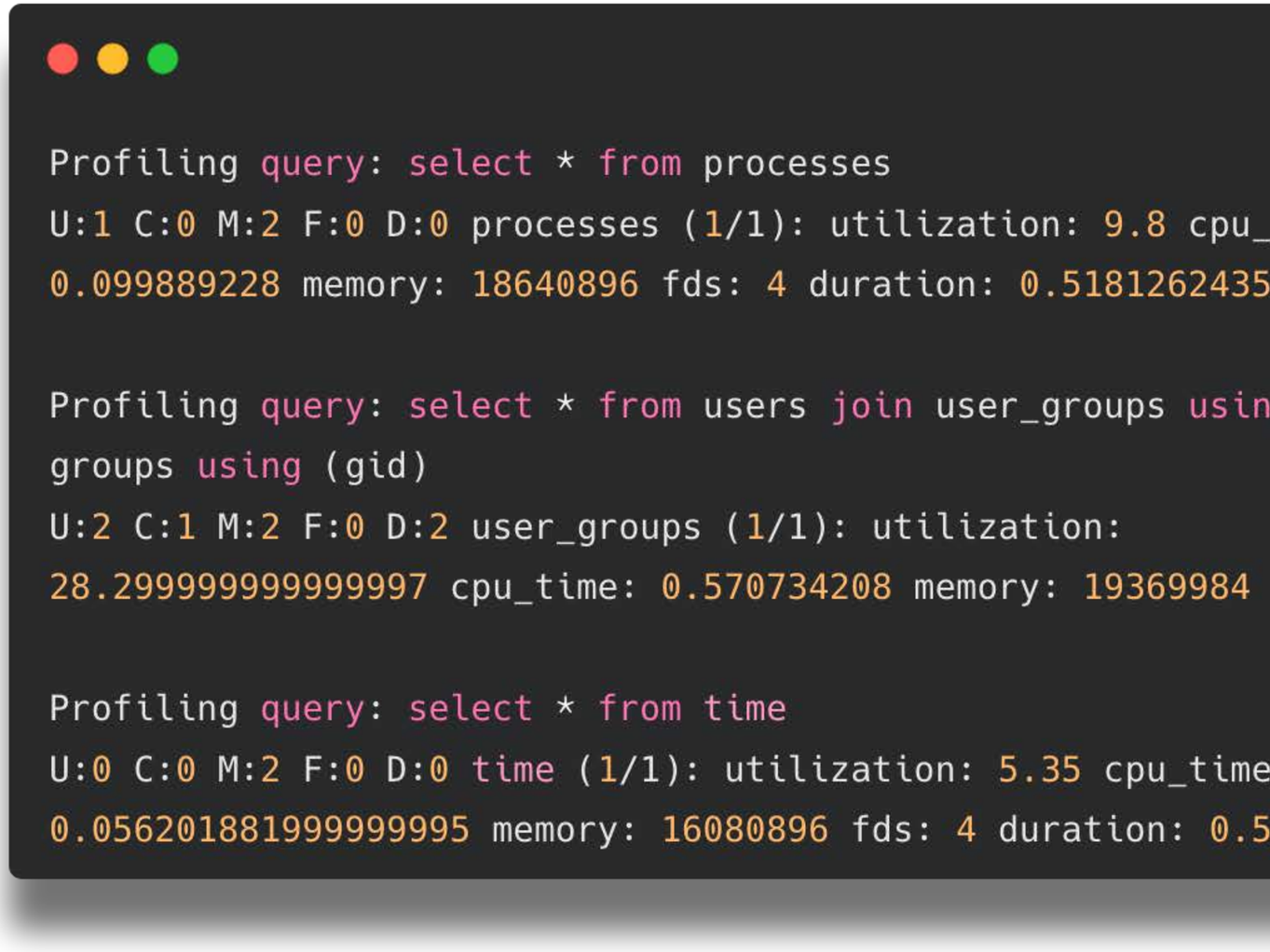
Linux cgroups

- Ask the kernel to maintain strict limits on the amount of CPU and memory utilized by the osquery process.
- Mitigates:
  - Production availability.
- Downside: Only compatible on Linux.

Osquery

Query Performance Profiling

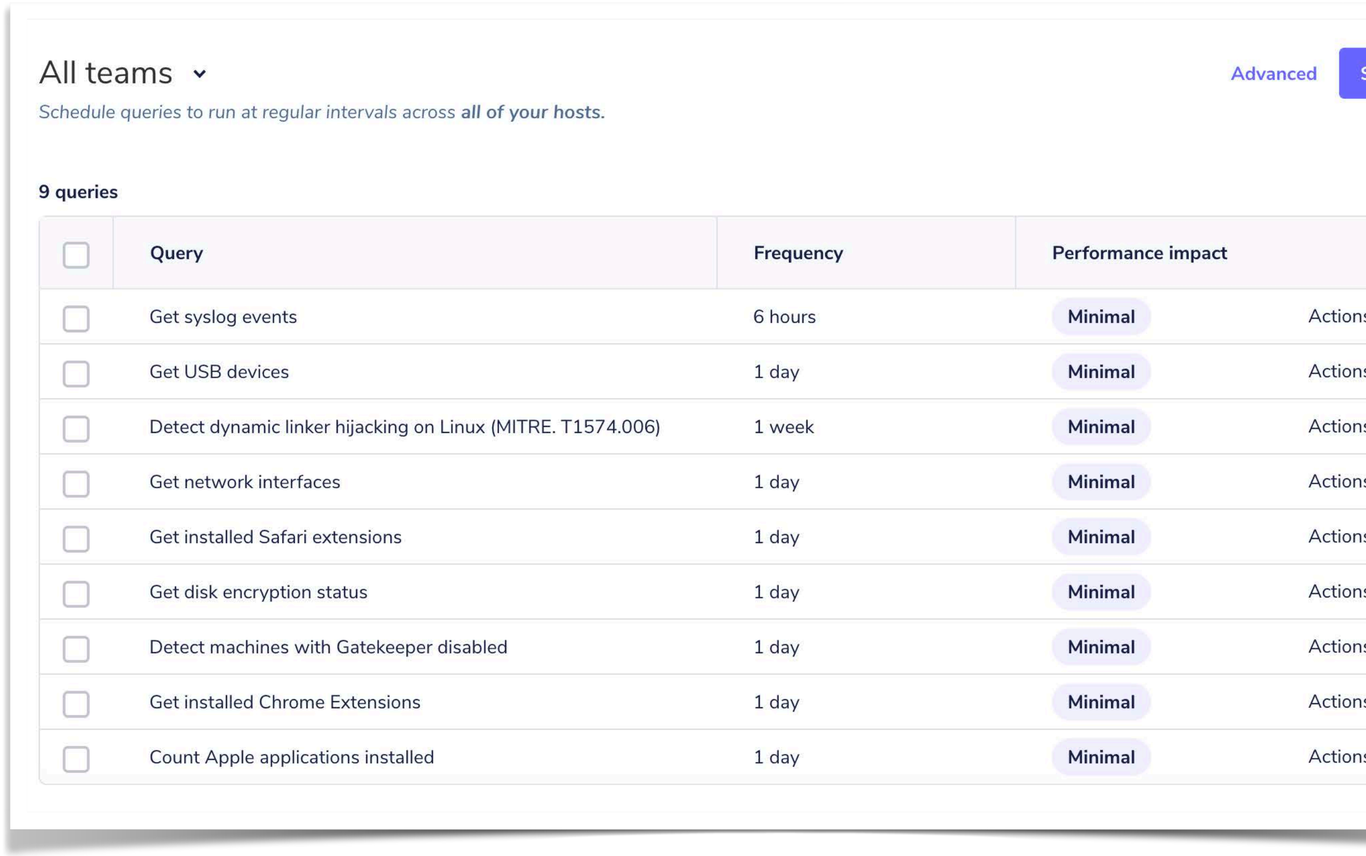
- Use tooling to estimate relative performance of queries.
- Mitigates:
  - Monitoring integrity
  - Compute cost



Osquery

Query Performance Monitoring

- Record statistics for real life query execution.
  - Shown here with simplified rendering in Fleet UI
- Mitigates:
  - Monitoring integrity
  - Compute cost



Fleet

Common Service Practices

- Multiple Fleet server processes run behind a load balancer.
- MySQL/Redis dependencies clustered with failover.
- Utilize autoscaling for efficient infra sizing.
- Mitigates:
  - Monitoring availability, latency, integrity
- Downside: Without proper sizing, can increase compute costs.

Fleet

Backpressure (Buffering)

- Buffer data on the clients (osquery) until the server is ready to ingest it.
- Requires coordination between client and server.
- Client buffers logs until the server confirms receiving them successfully.
- Mitigates:
  - Monitoring integrity, compute costs
- Downside: (Possibly) increased latency, integrity compromised in extreme cases.

Engineering Resilience

Engineering Resilience

Self Managed

- Fleet's software (both agents and servers) is entirely self-managed by customers.
- Self Managed Challenges:
  - Environments are inconsistent.
  - Deploys are slow (not in our control).
  - Debugging feedback loop is slow.

Engineering Resilience

Consistency

- More heterogeneous deployments = more edge cases.
- MySQL... or MariaDB, Aurora, etc.
- Redis... Cluster, Sentinel, etc.
- Encourage deployment consistency.
  - Infrastructure as code (Fleet Terraform).
  - Reference Architectures (Fleet Reference architecture).

Up to 25000 hosts

Fleet instances	CPU Units	RAM
10 Fargate task	1024 CPU Units	4GB

Dependencies	Version	Instance type
Redis	6	m6g.large
MySQL	5.7.mysql_aurora.2.10.0	db.r6g.large

Up to 150000 hosts

Fleet instances	CPU Units	RAM
30 Fargate task	1024 CPU Units	4GB

Dependencies	Version	Instance type	Nodes
Redis	6	m6g.large	3
MySQL	5.7.mysql_aurora.2.10.0	db.m6g.8xlarge	1

https://fleetdm.com/docs/deploying/reference-architectures

Engineering Resilience

Testing

- Automate, automate, automate.
- Metric: How many experiments can we run per week?
- More experiments = more chaos = more edge cases = more issues detected
- Infrastructure as Code comes into play here again.
  - Easier to spin up and down and change parameters of test environments.

Engineering Resilience

Testing

- Generic HTTP testing tools may not cover your edge cases, and don't know the production hot-paths.
- Build custom tooling!
- For Fleet, we created custom tooling to simulate osquery agents.
  - Hot path: Agent check-ins, processing received data.
  - Simulate agents efficiently (no need for a full osquery process, just pretend to be a remote osquery).

```
        },
        "system_info": {
            "computer_name": "{{ .CachedString "hostname" }}",
            "cpu_brand": "Intel(R) Core(TM) i7-4770HQ CPU @ 2.20GHz\u0000\u0000\u0000\u0000\u0000\u0000\u0000",
            "cpu_logical_cores": "8",
            "cpu_physical_cores": "4",
            "cpu_subtype": "Intel x86-64h Haswell",
            "cpu_type": "x86_64h",
            "hardware_model": "MacBookPro11,4",
            "hardware_serial": "D02R835DG8WK",
            "hardware_vendor": "Apple Inc.",
            "hardware_version": "1.0",
            "hostname": "{{ .CachedString "hostname" }}",
            "local_hostname": "{{ .CachedString "hostname" }}",
            "physical_memory": "17179869184",
            "uuid": "{{ .UUID }}"
        }
    },
    "host_identifier": "{{ .CachedString "hostname" }}",
    "platform_type": "16"
}
{{- end }}
```

https://github.com/fleetdm/fleet/blob/main/cmd/osquery-perf/mac10.14.6.tmpl

Engineering Resilience

Debugging

- Debugging tooling plays a dual role with staging (load test) and production:
  - Detect issues before they become incidents.
  - Resolve incidents quicker.
- Collect first, ask questions later.
- `fleetctl debug archive`

https://fleetdm.com/docs/using-fleet/monitoring-fleet#generate-debug-archive-fleet-3-4-0

Focus

fleet

Consistency

Testing Automation

Debug Tooling.

Thank you

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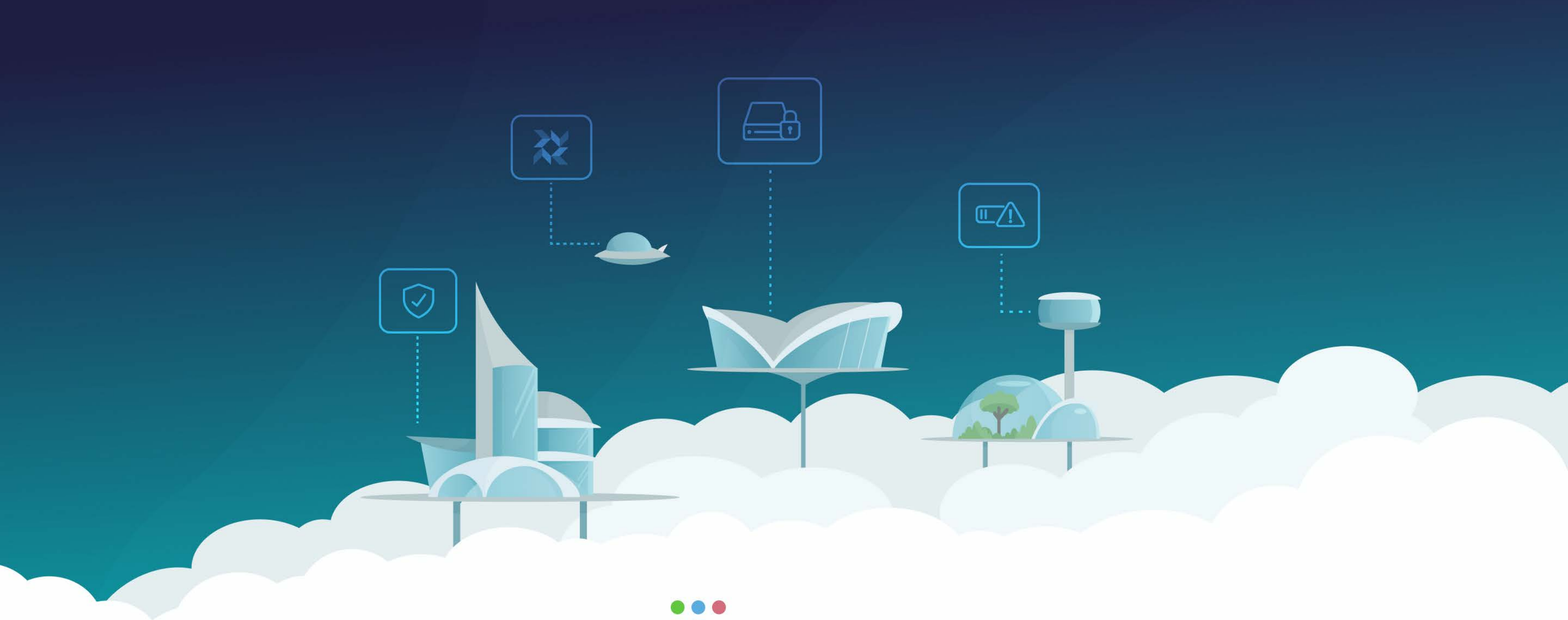
@thezachw

@zwass

We're hiring:

fleetdm.com/jobs

fleet



fleet