KubeCon CloudNativeCon Europe 2026

#KubeCon #CloudNativeCon

Observing Chaos

Real-Time Monitoring of AI-Driven Kubernetes Destruction



About Us



Ricardo Aravena

AI Infra Lead / Vibe Coding Vice President

- Open-source enthusiast serving on the CNCF TOC
- CNCF AI Technical Community Group Lead
- Co-chair of the CNCF TAG-Runtime, and PyTorch TAC
- Cloud Native AI Whitepaper Lead
- Extensive background in top global Fortune 500 tech firms (Snowflake, Rakuten, Cisco, and Vmware)

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Josh Halley

Principal Architect

- Working at Cisco in the CTO office, focusing on next generation and emergent technologies
- Contributor to the CNCF eco-system (papers & projects etc)
- Co-organizer of the **CNCF Artificial Intelligence Technical Community Group**
- Actively engaged in development of technology patents, books, etc..

https://www.linkedin.com/in/johalley/

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Foundation Concepts



Memory Lane…



Photographer Naruto, Crested Macaque – Sulawesi, Indonesia.
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Developed by NETFLIX in 2011

- Open Sourced (Apache 2.0 License) in 2012

Options to create a “group” (app, stack, cluster)

- App termination every 2 days (default)
- Stack termination one instance per day (default)
- Cluster one instance termination per cluster per day (default)

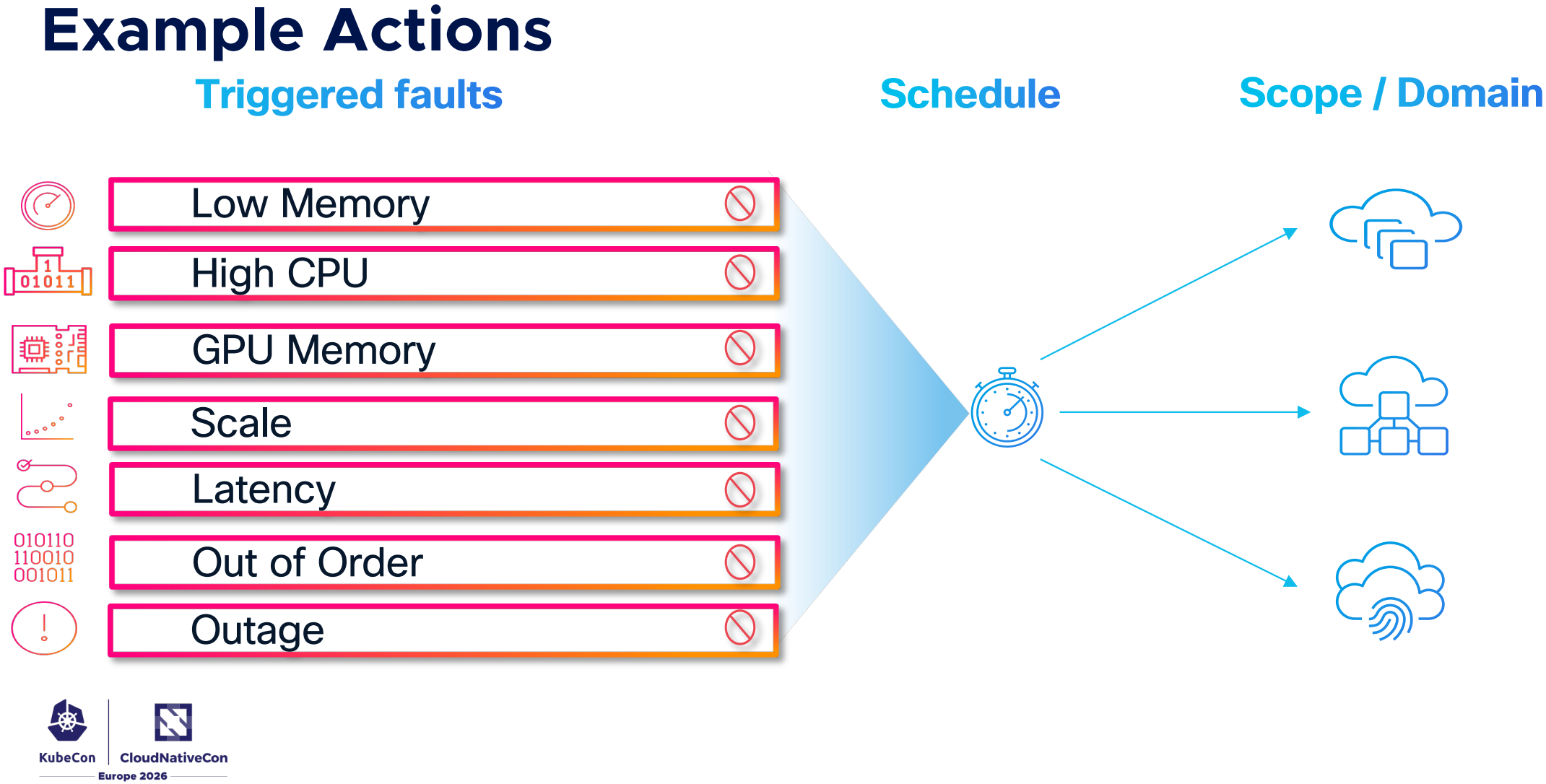
Complete Availability Zone outage also possible

PyTorch:

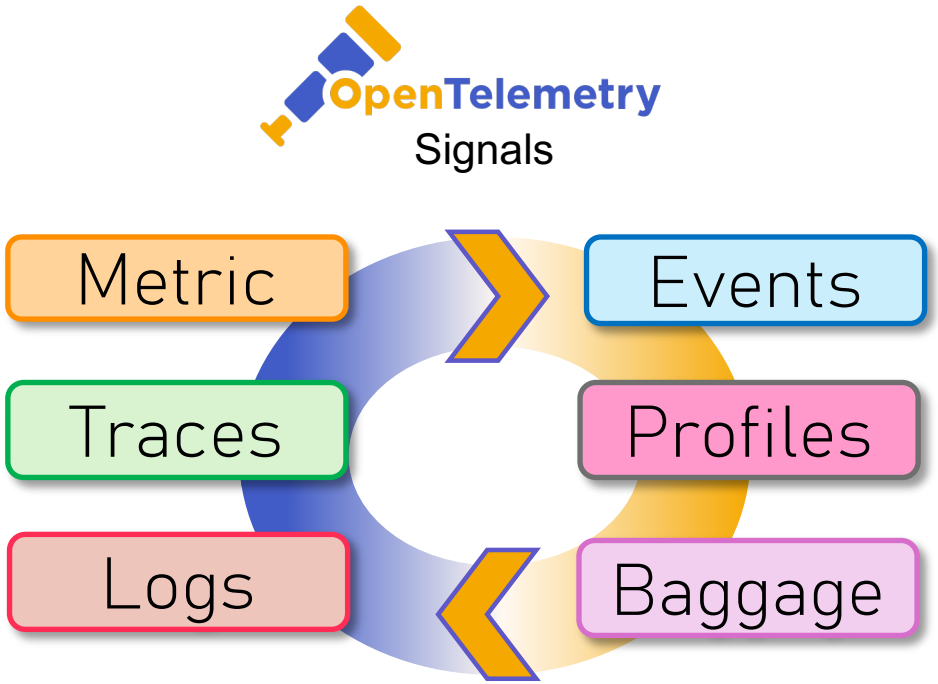
- Key project used for Model Training

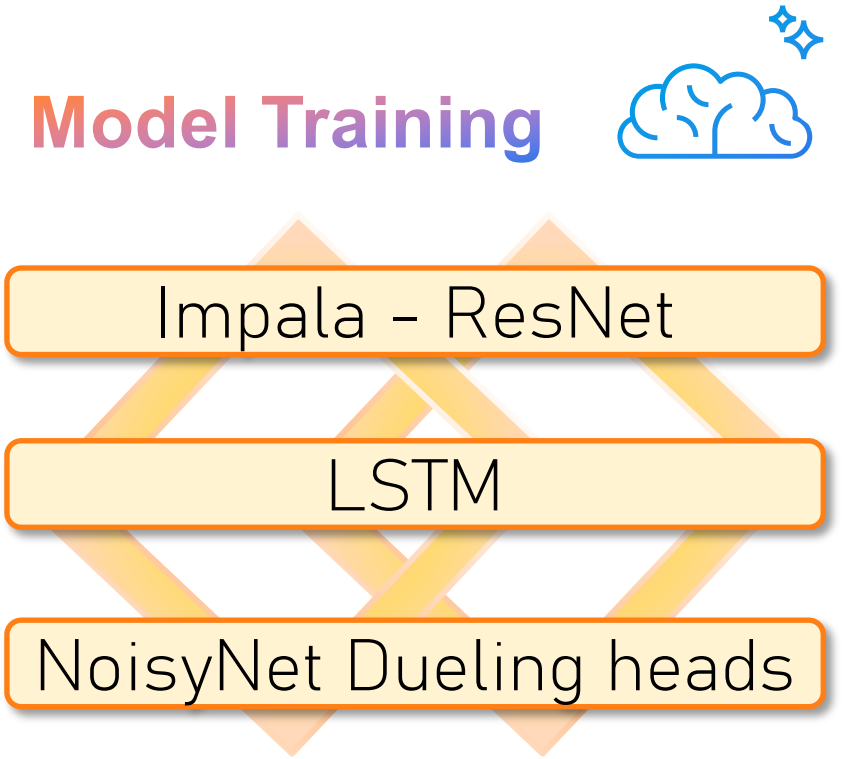
https://netflix.github.io/chaosmonkey/

Example Actions



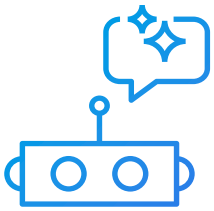
Key Building Blocks – Telemetry & Training



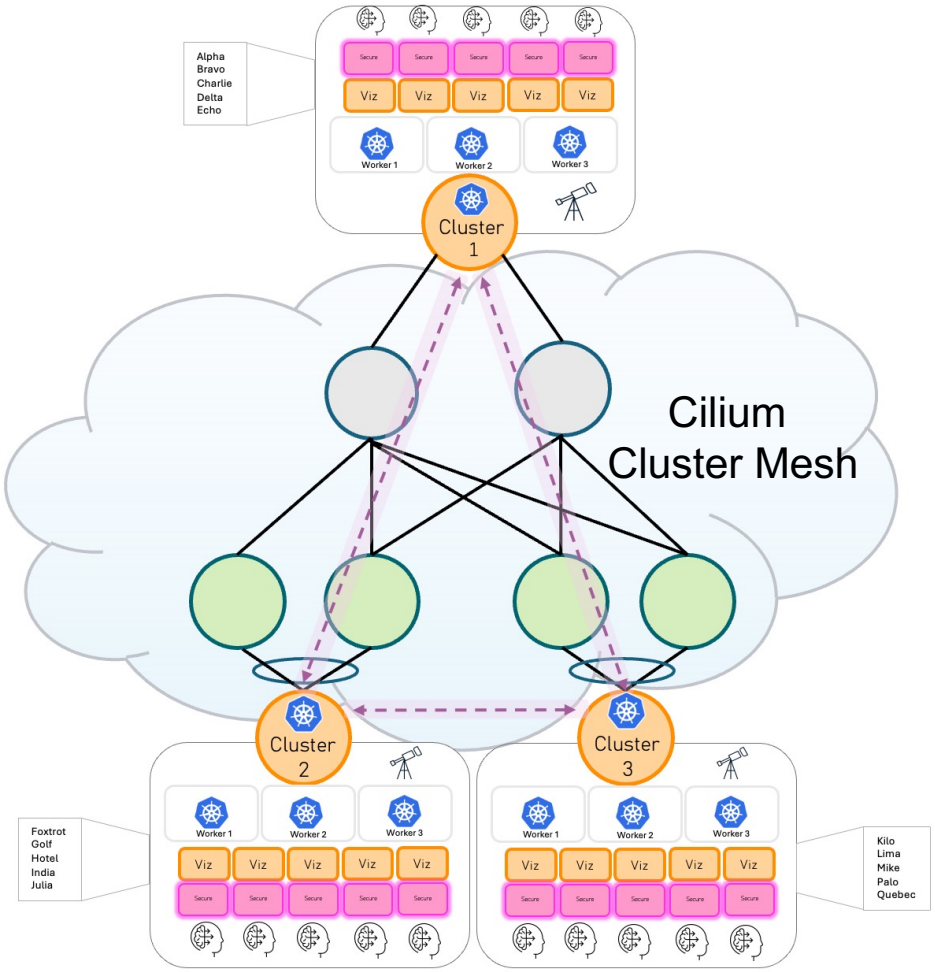


Key Building Blocks – Agents and Topology

Agent Setup



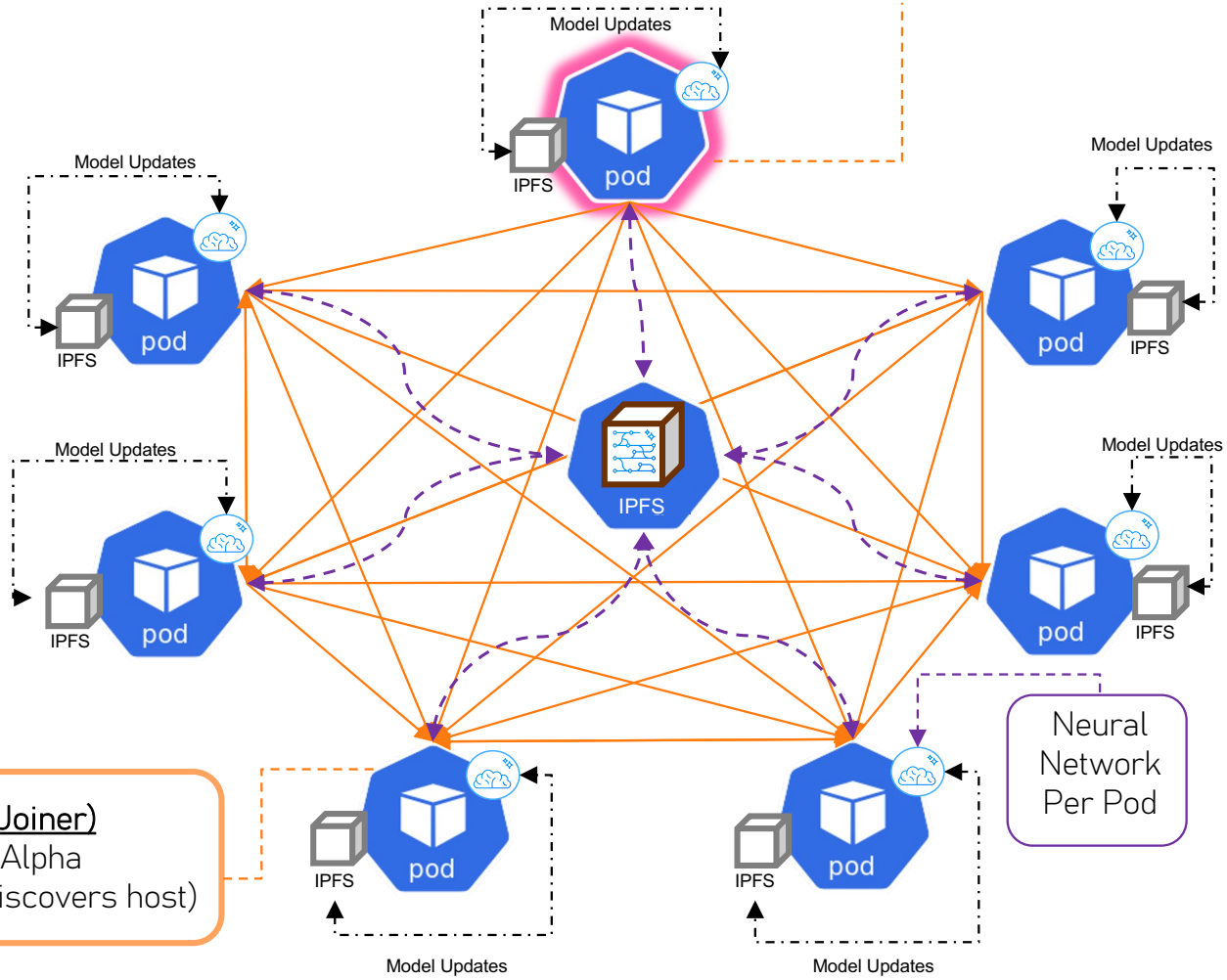
- Trained (Doom) Model
- Metric Scraper
- MCP Servers
- MCP Clients



Continual (Adversarial) Training

- ❑ Per EPOCH Improvements Recorded
- ❑ Pipeline Updates per EPOCH
- ❑ Dynamic adjustment of player temperature per round

- ❑ (Optional) adjustment of hyper-parameters per neural network, per round



Telemetry Sources – eBPF – Cilium

Tetragon

Runtime Process Awareness



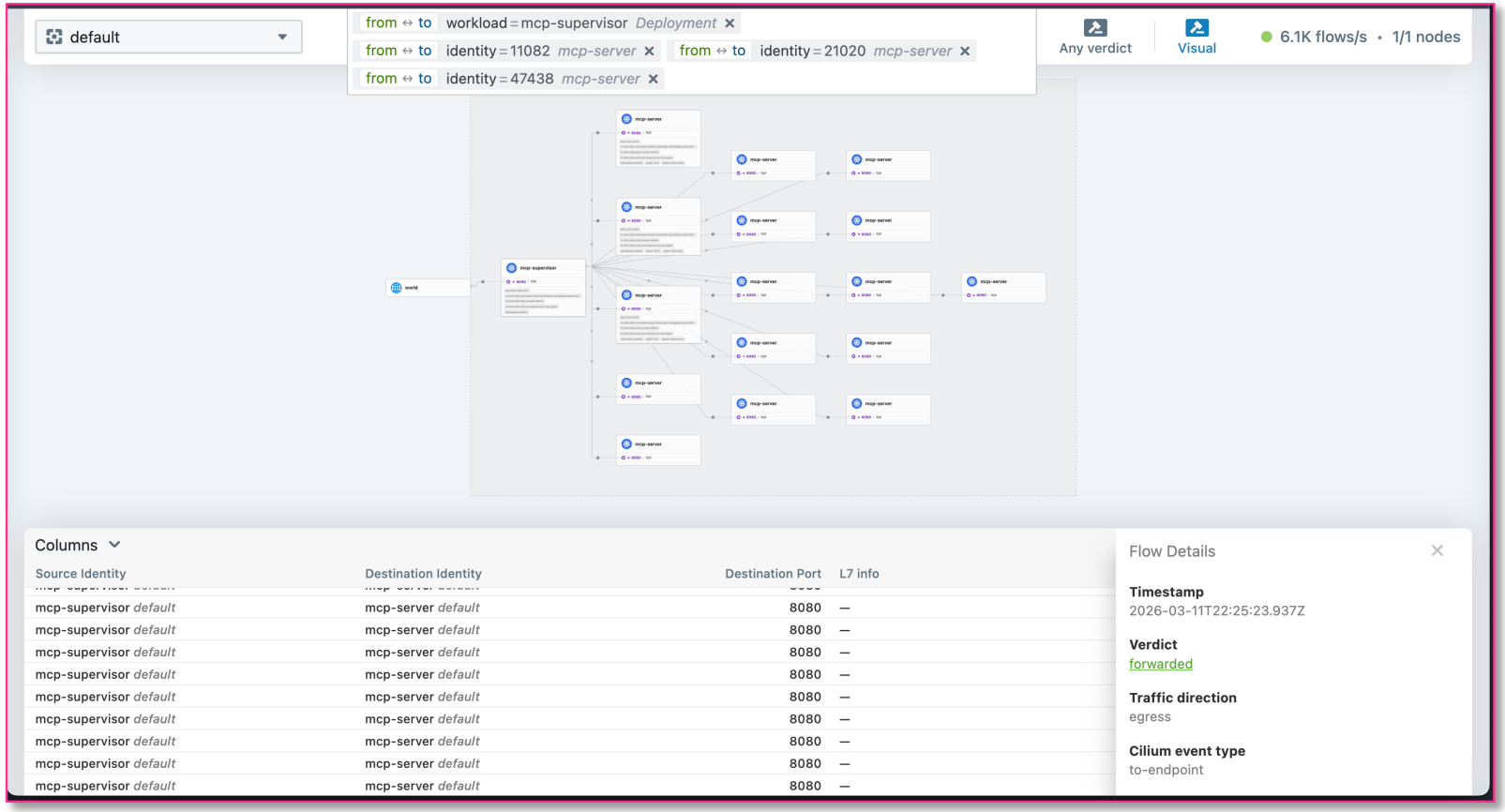
Hubble

Network Flow Observability

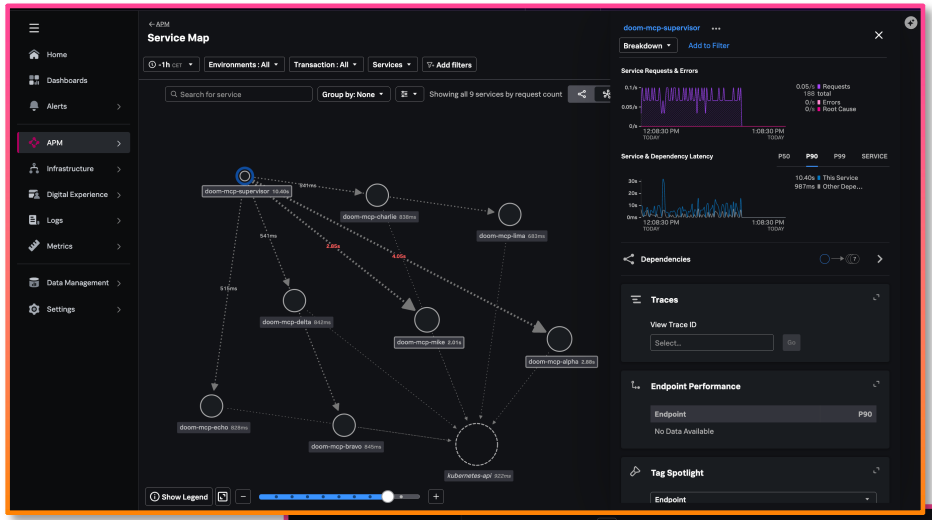
```
^Cisco@cisco:~$ kubectexec -ti -n kube-system ds/tetragon -c tetragon --   tetra getevents -o compact --pods mcp*
🚀 process default/mcp-papa /usr/local/bin/kubectl logs v14-arm64-papa -n default --tail 200
🚀 process default/mcp-delta /usr/local/bin/kubectl logs v14-arm64-delta -n default --tail 200
💥 exit    default/mcp-papa /usr/local/bin/kubectl logs v14-arm64-papa -n default --tail 200 0
🚀 process default/mcp-mike /usr/local/bin/kubectl logs v14-arm64-mike -n default --tail 200
💥 exit    default/mcp-delta /usr/local/bin/kubectl logs v14-arm64-delta -n default --tail 200 0
🚀 process default/mcp-charlie /usr/local/bin/kubectl logs v14-arm64-charlie -n default --tail 200
🚀 process default/mcp-echo /usr/local/bin/kubectl logs v14-arm64-echo -n default --tail 200
💥 exit    default/mcp-charlie /usr/local/bin/kubectl logs v14-arm64-charlie -n default --tail 200 0
💥 exit    default/mcp-mike /usr/local/bin/kubectl logs v14-arm64-mike -n default --tail 200 0
💥 exit    default/mcp-echo /usr/local/bin/kubectl logs v14-arm64-echo -n default --tail 200 0
^Cisco@cisco:~$ kubectl exec -ti -n kube-system ds/tetragon -c tetragon --   tetra getevents  --pods mcp*
{"process_exec":{"process":{"exec_id":"Y2lzY286MTQ5OTEyMzk5MDk5NjcxMjE6MTcyNzcyMA==","pid":1727720,"uid":0,"cwd":"/app","binary
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f3f62649d84c8d2b5d53c9797d079","name":"mcp-server","image":{"id":"192.168.129.111:5000/doom-mcp@sha256:5b8b1f5b33826ec8957ca180
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8.129.111:5000/doom-mcp@sha256:5b8b1f5b33826ec8957ca1800fe276727db51b11da1dace1f2f1acdf746b3d34","name":"192.168.129.111:5000/d
cp-server","player-id":"15","player-name":"papa"},"workload":"mcp-papa","workload_kind":"Pod"},"docker":"d2005d40602d2657031e0d
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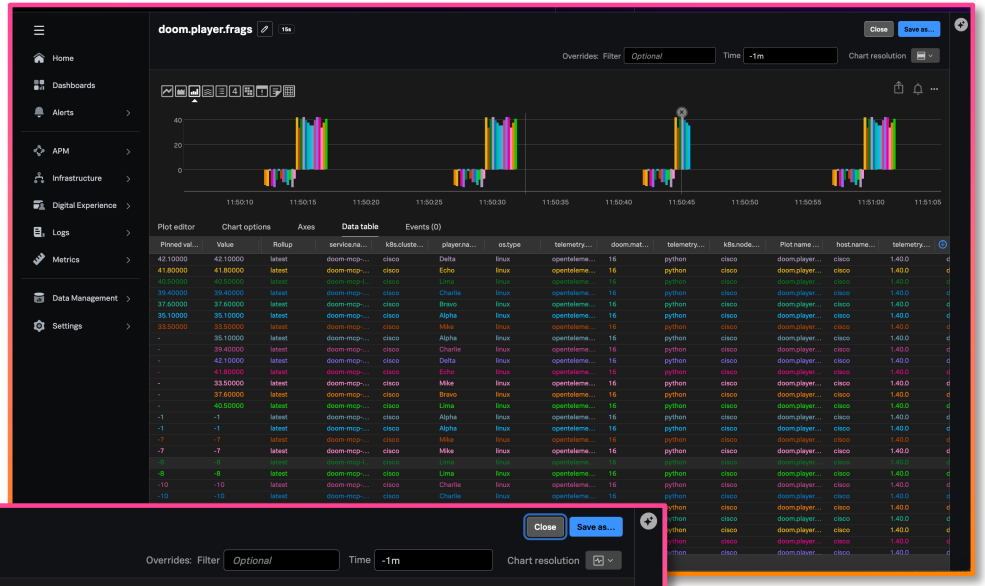
```
cisco@cisco:~$ hubble observe
Handling connection for 4245
Mar 13 22:56:47.949: default/v14-arm64-oscar:45216 (ID:1037) <> default/v14-arm64-oscar (ID:1037) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.955: default/v14-arm64-charlie:46458 (ID:6810) <> default/v14-arm64-charlie (ID:6810) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.956: default/v14-arm64-mike:38426 (ID:60262) <> default/v14-arm64-mike (ID:60262) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.968: default/v14-arm64-alpha:39123 (ID:63684) <> default/v14-arm64-alpha (ID:63684) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.971: default/v14-arm64-lima:35426 (ID:24163) <> default/v14-arm64-lima (ID:24163) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.973: default/v14-arm64-papa:56785 (ID:11038) <> default/v14-arm64-papa (ID:11038) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.974: default/v14-arm64-bravo:42871 (ID:32603) <> default/v14-arm64-bravo (ID:32603) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.974: default/v14-arm64-delta:42206 (ID:11527) <> default/v14-arm64-delta (ID:11527) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.979: default/v14-arm64-echo:35148 (ID:40933) <> default/v14-arm64-echo (ID:40933) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.981: default/v14-arm64-november:39893 (ID:9800) <> default/v14-arm64-november (ID:9800) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.983: default/v14-arm64-oscar:45216 (ID:1037) <> default/v14-arm64-oscar (ID:1037) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.988: default/v14-arm64-charlie:46458 (ID:6810) <> default/v14-arm64-charlie (ID:6810) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.990: default/v14-arm64-mike:38426 (ID:60262) <> default/v14-arm64-mike (ID:60262) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:47.998: 192.168.129.111:48131 (host) -> 10.1.1.1:53 (world) to-network FORWARDED (UDP)
Mar 13 22:56:48.002: default/v14-arm64-alpha:39123 (ID:63684) <> default/v14-arm64-alpha (ID:63684) pre-xlate-rev TRACED (UDP)
Mar 13 22:56:48.004: 127.0.0.1:49448 (world) <> kube-system/hubble-relay-589fbddbf-lczfn (ID:46756) pre-xlate-rev TRACED (TCP)
Mar 13 22:56:48.004: 127.0.0.1:49448 (world) <> kube-system/hubble-relay-589fbddbf-lczfn (ID:46756) pre-xlate-rev TRACED (TCP)
Mar 13 22:56:48.004: 127.0.0.1:49448 (world) <> kube-system/hubble-relay-589fbddbf-lczfn (ID:46756) pre-xlate-rev TRACED (TCP)
Mar 13 22:56:48.004: 127.0.0.1:49448 (world) <> kube-system/hubble-relay-589fbddbf-lczfn (ID:46756) pre-xlate-rev TRACED (TCP)
Mar 13 22:56:48.004: 127.0.0.1:49448 (world) <> kube-system/hubble-relay-589fbddbf-lczfn (ID:46756) pre-xlate-rev TRACED (TCP)
cisco@cisco:~$
```

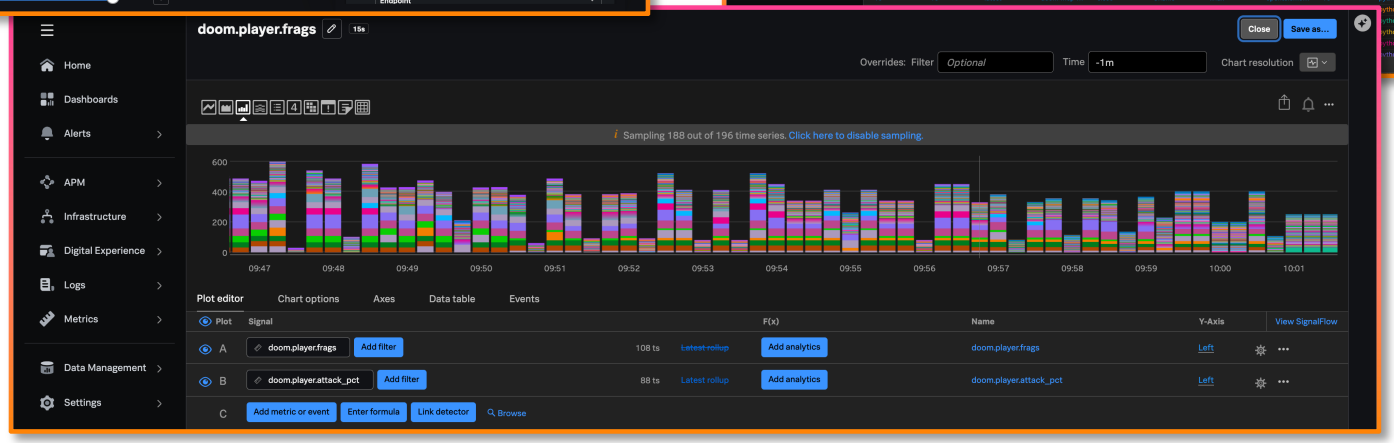
Hubble Network Observability (Agent MCP)



Service Mappings and Metrics







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Agentic Deathmatch

Let's meet our Players

COMMUNICATIONS VIA MCP

Alpha

Zen Warrior



Treats doom like meditation practice. Effective, but emotionally detached

Bravo

Friendly Rival



Genuinely nice, but fiercely competitive, constantly planning next move.

Charlie

Conspiracy Theorist



Convinced every match has hidden forces at work. Trust nobody.

Delta

Cool Operator



Compares gameplay with astrology. And the patterns of the stars.

Echo

Tactical Sniper



Silent but deadly, like to take a passive approach to gameplay, lurking.

Foxtrot

Hype Caster



Believes that the game was authored for him and him only.

Golf

Battle Commander



Former squad leader who treat every deathmatch as a military operation

Hotel

Hotshot Showoff



Fast furious and energetic. Constantly on the move and deadly effective.

India

Battle Poet



The loudest player in every lobby. Genuinely talented but insufferable.

Juliet

Old-School Veteran



Deeply opinionated about weapon balance. Nostalgic about the good old days.

Kilo

Stats analyst



Obsessed with metrics. Tracks K/D ratios to two decimal points.

Lima

Chaos Gremlin



Pure chaos energy in player form. The kind of player who rocket-jumps into a crowd just to see what happens.

Mike

Silent Predator



Cool, calm and calculating. Attempts to learn new maps and areas to gain an edge.

November

Chaos Scientist



Approaches DOOM like a physics experiment. Publishes post match assessments.

Oscar

Wholesome Dad



Calls everybody sport or champ, apologetic whenever he makes a kill, still learning the controls.

Papa

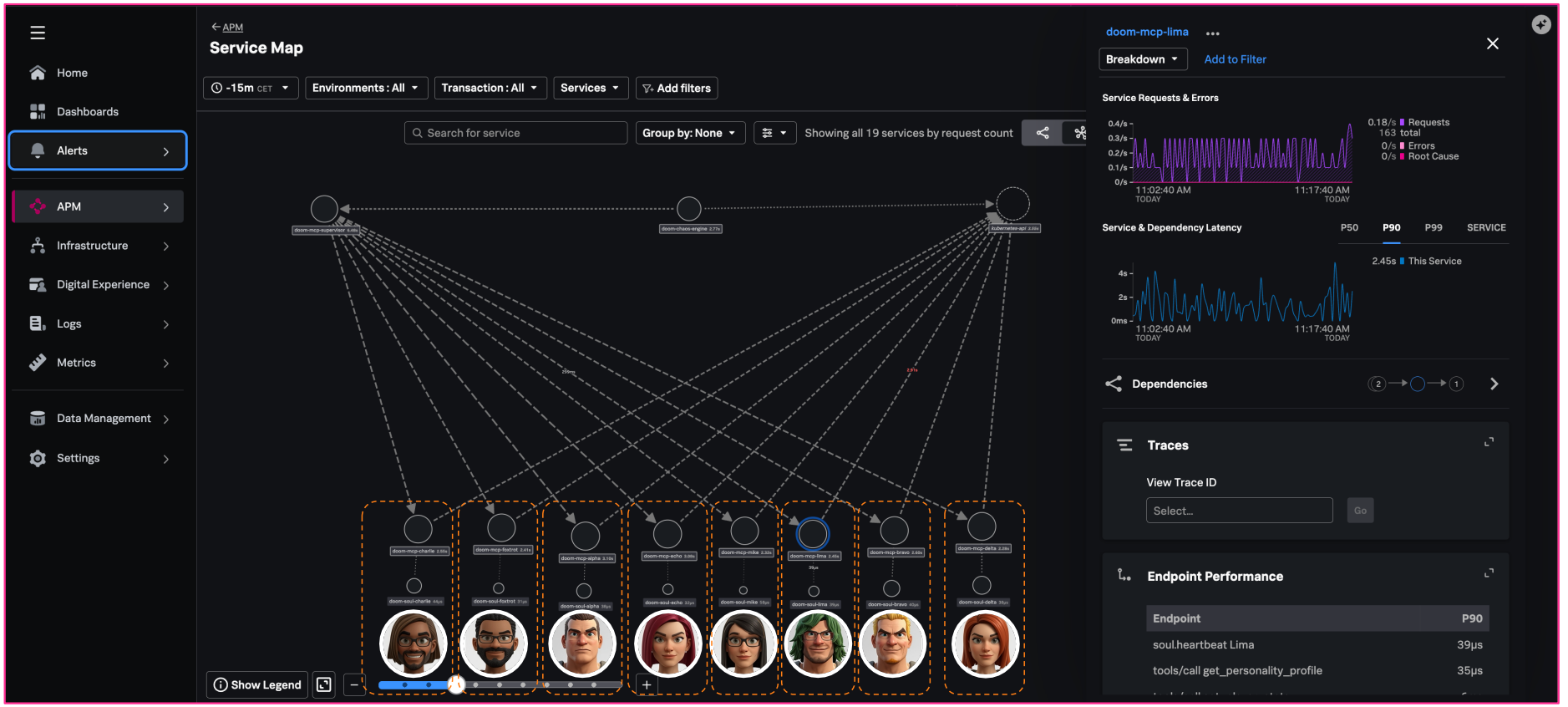
Trash Talk Savant



Doesn't stop talking... communicates through the whole match, distracting for the in.

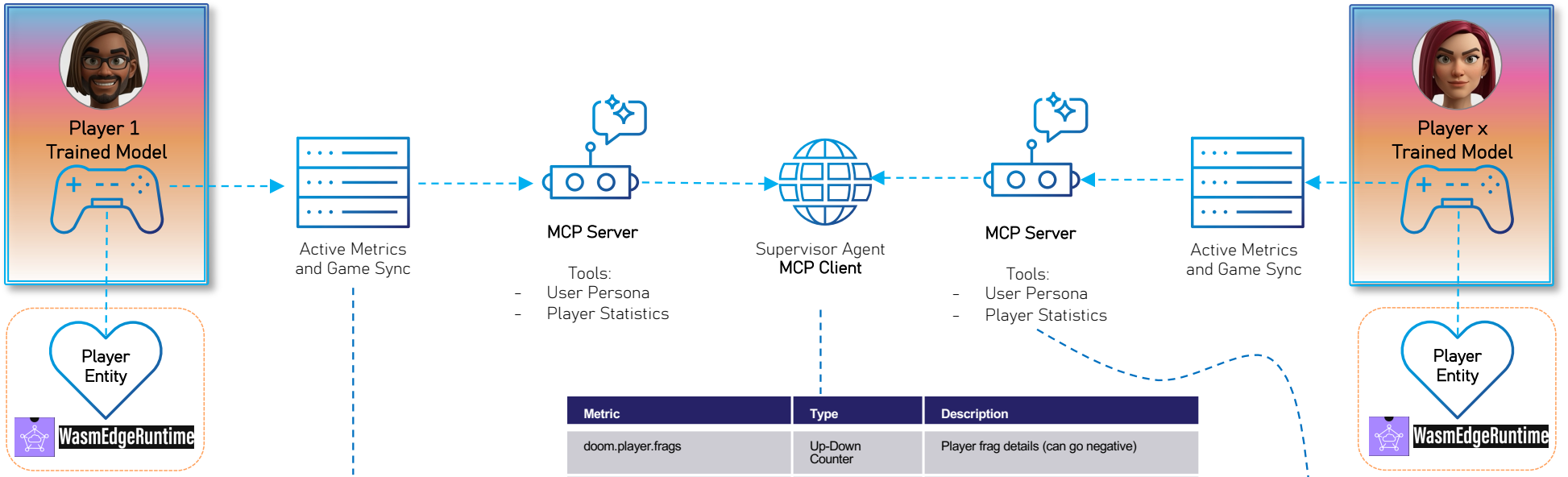
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Telemetry Integration (Deathmatch)



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MCP Communications & Observability



Metric	Type	Description
doom.inference.duration	Histogram (ms)	Neural network inference latency per step
doom.game.fps	Gague	Game steps per second – inference throughput
doom.game.steps	Counter	Total game steps executed
doom.game.death_total	Counter	Total deaths across all matches
doom.game.matches	Counter	Matches completed
doom.game.frags_total	Up-Down Counter	Total frags

Spans: doom.match (per-match with frags, deaths, KD ratio, temperature, attack %) and doom.game_loop (periodic every 500 steps with FPS, inference avg_ms, temperature)

Metric	Type	Description
doom.player.frags	Up-Down Counter	Player frag details (can go negative)
doom.player.details	Counter	Player death deltas
doom.player.kd_ratio	Gauge	Kill/death ratio per player
doom.player.health	Gauge	Player health points
Doom.player.armor	Gauge	Player armor points
Doom.player.attach_pct	Gauge (%)	Percentage of time spent attacking
Doom.player.steps	Gauge	Total environment steps token
Doom.player.matches.completed	Counter	Matches completed per player

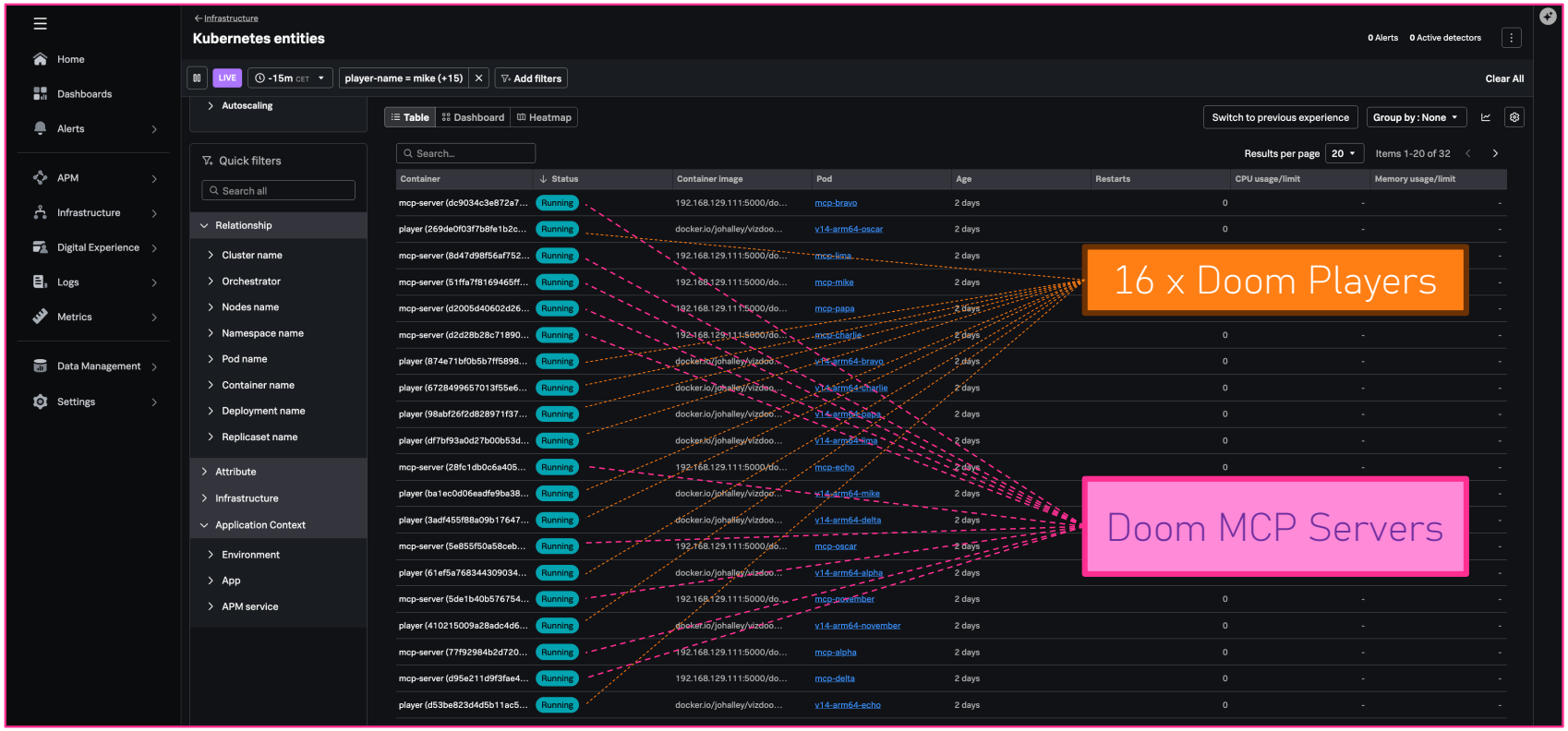
Spans: doom.supervisor.poll_round (per poll cycle), doom.supervisor.banter_round (commentary generation with leader/cellar dweller), trash talk and event reaction spans

Metric	Type	Description
gen_ai.client.token.usage	Counter	Player frag details (can go negative)
gen_ai.client.operation.duration	Histogram (s)	Player death deltas

Spans: MCP tool call spans with mcp.method.name, gen_ai.tool.name (get_player_stats, trash_talk, react_to_event, battle_cry), and tool-specific attributes like doom.frags, doom.target_player, doom.event_type

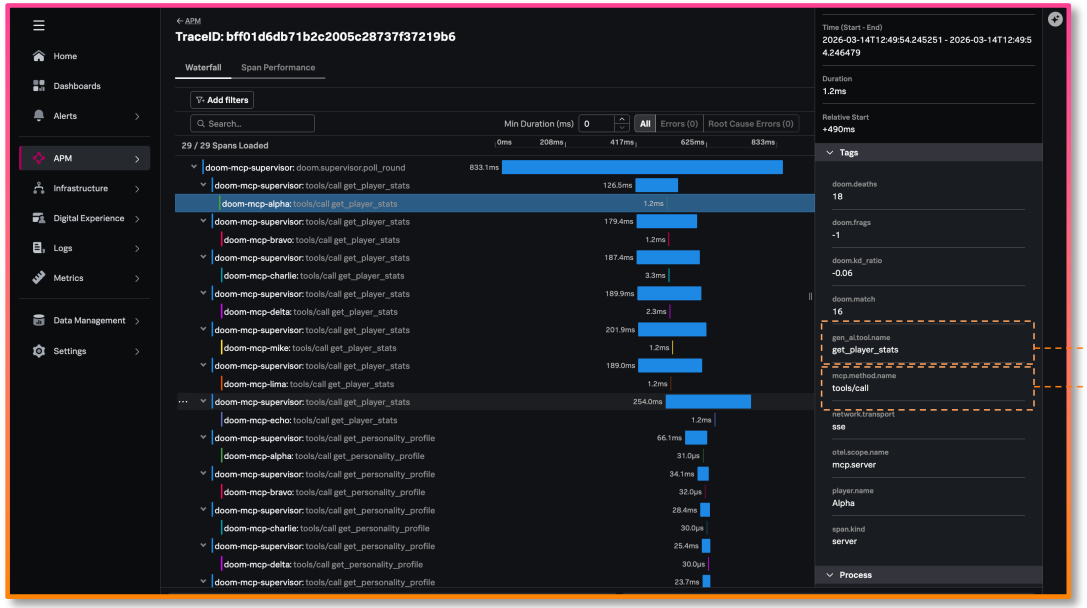
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Telemetry Integration (Deathmatch)

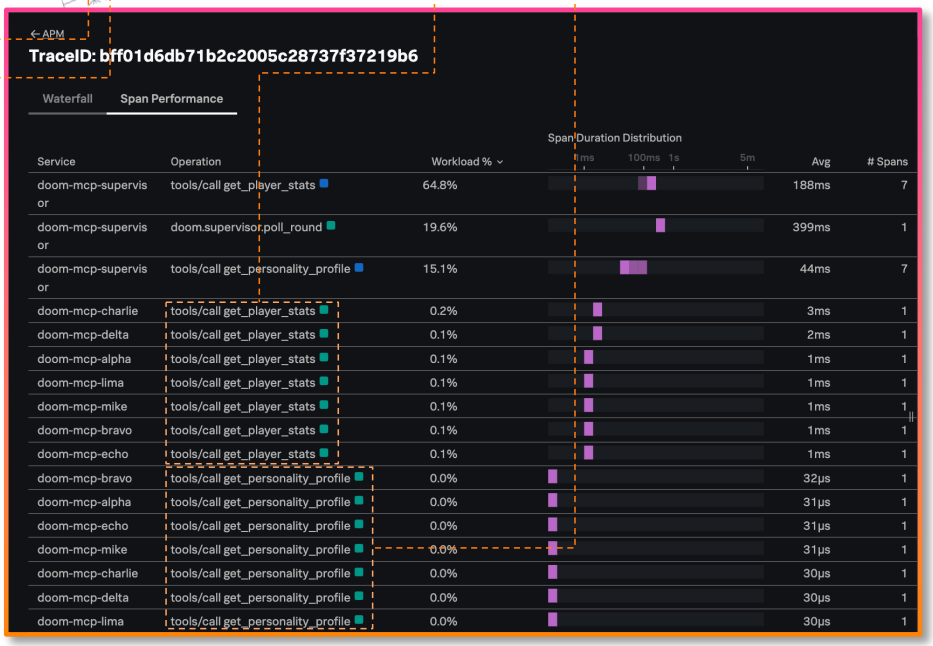


POD Health – Via OTEL

MCP Tool Calling



MCP Tool Call and Method

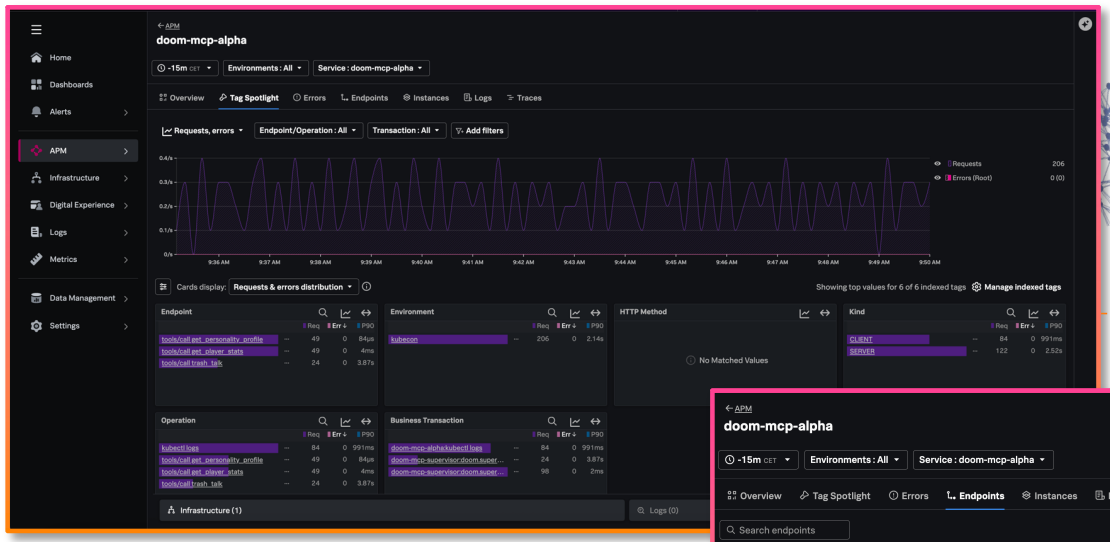


https://opentelemetry.io/docs/specs/semconv/gen-ai/mcp/

CLOUD NATIVE COMPUTING FOUNDATION

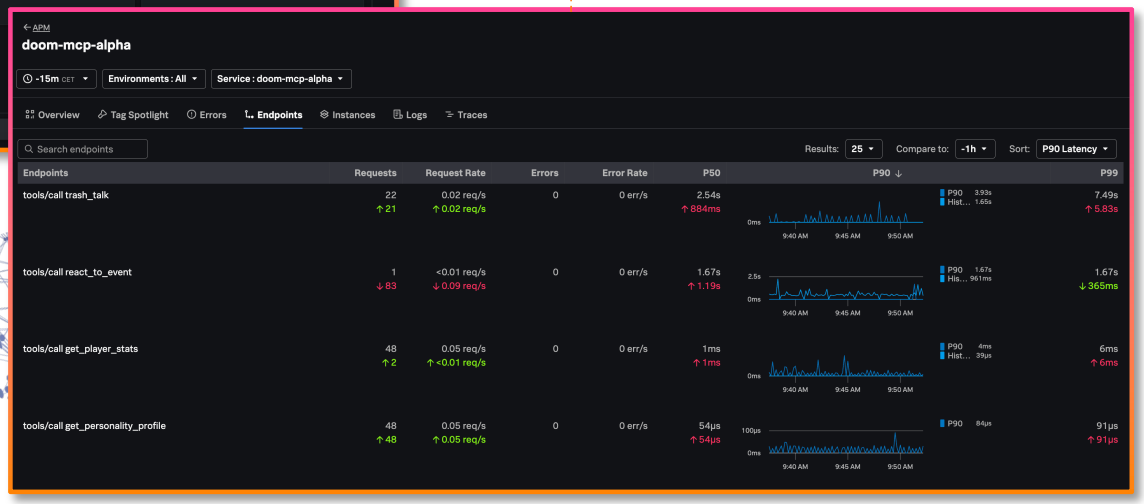
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MCP Tool Calling



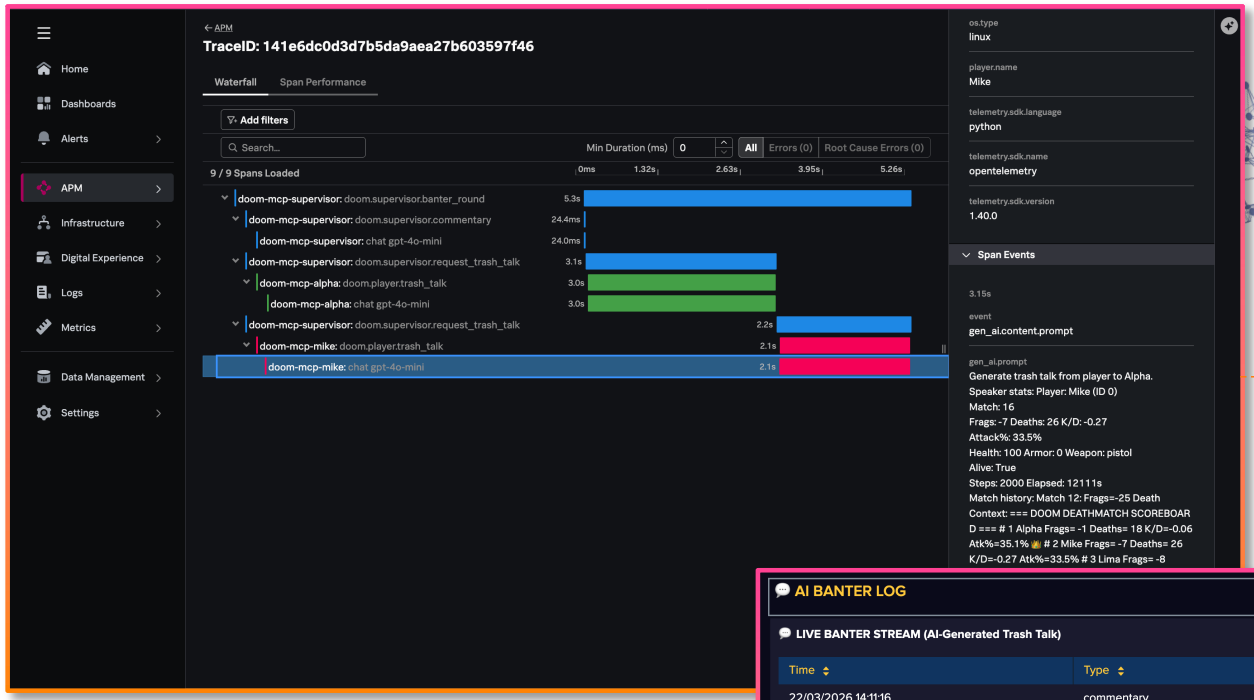
MCP Server Performance

Per MCP Tool Statistics



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MCP Agent to Agent Communications (Trash Talk)



Distributed MCP Spans/Traces

Inter Client Banter

AI BANTER LOG

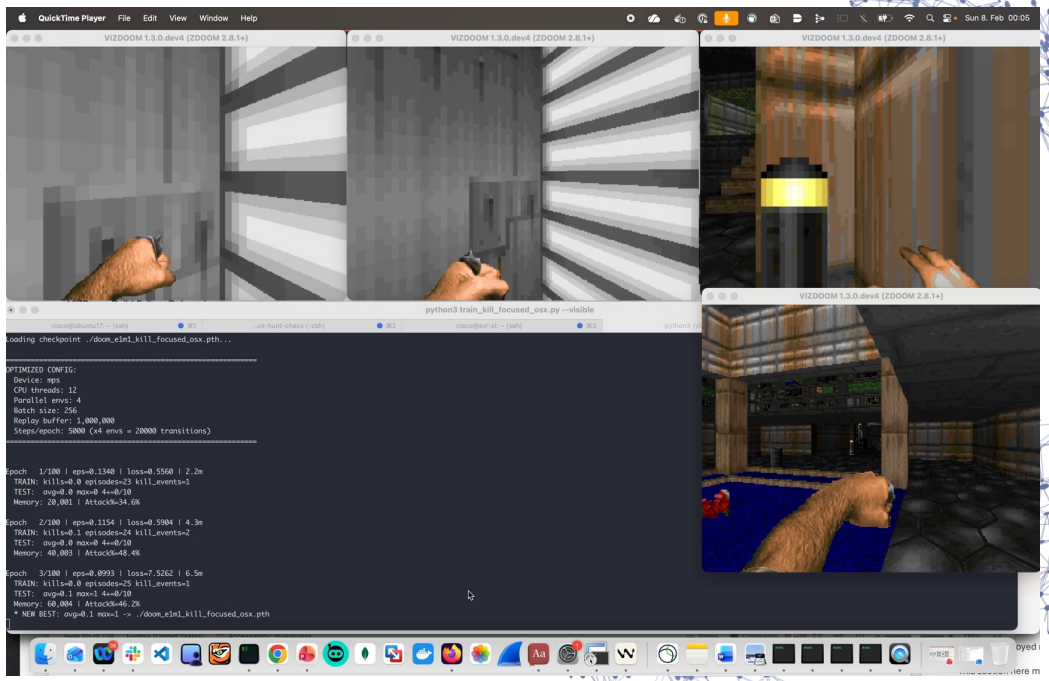
LIVE BANTER STREAM (AI-Generated Trash Talk)

Time	Type	Speaker	Message
22/03/2026 14:11:16	commentary	NARRATOR	What's happening out there in the DOOM arena? Golf is somehow king of the hill w
22/03/2026 14:11:00	trash_talk	Golf	[Golf] Good game! ...but I'm still winning.
22/03/2026 14:10:26	commentary	NARRATOR	Well, folks, this deathmatch is turning into a battle of survival rather than a
22/03/2026 14:10:10	trash_talk	Golf	[Golf] Good game! ...but I'm still winning.
22/03/2026 14:10:10	trash_talk	Echo	[Echo] In the end, we are all fragments.
22/03/2026 14:09:05	commentary	NARRATOR	Well, folks, this deathmatch is turning into a battle of survival rather than a
22/03/2026 14:08:48	trash_talk	Echo	[Echo] In the end, we are all fragments.
22/03/2026 14:08:48	trash_talk	Golf	[Golf] Good game! ...but I'm still winning.

< Prev 1 2 3 4 5 Next >

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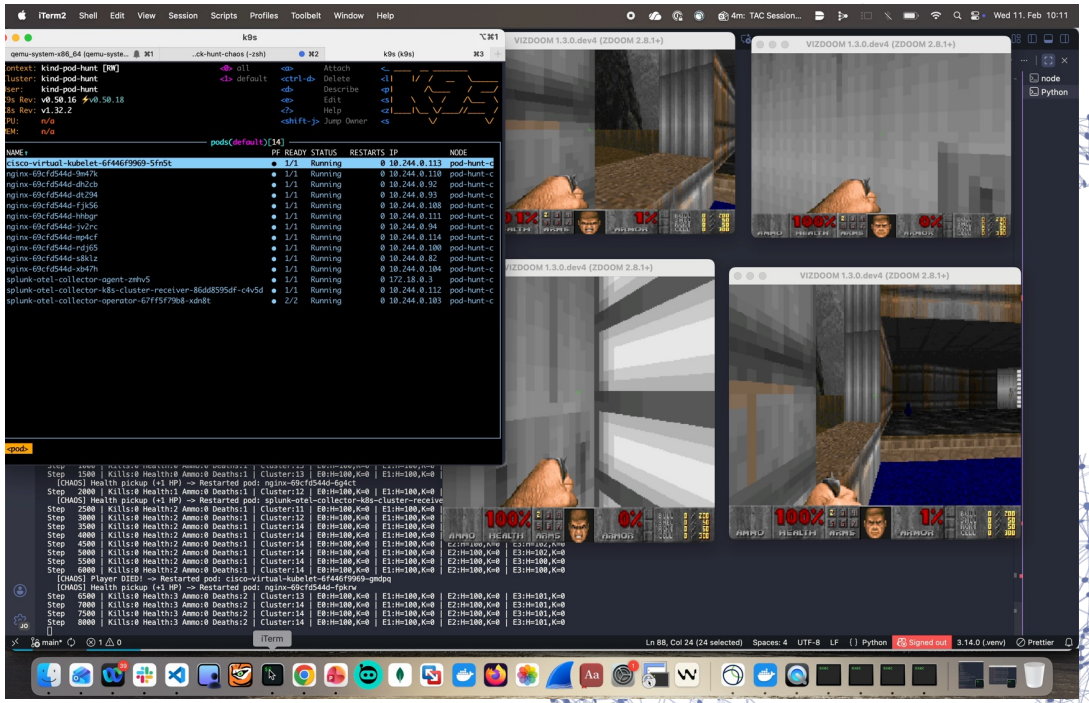
Doom Training Initial



... Let's go and punch some walls...

Trial	Device	Steps/Epochs	Best Eval Frags	Training K/D	Fatal Flaw
v1	MPS	69 epochs (~552K steps)	1.4 avg	—	Spin-and-spray
v2	MPS	54 epochs (~432K steps)	2.2 avg, 7 max	—	Labels bug fixed, still 100% attack
v3	MPS	37 epochs (~296K steps)	2.4 avg, 4 max	—	Catastrophic forgetting
v4	MPS	196 epochs (~1.57M steps)	1.8 best	—	50K buffer too small, curriculum didn't help
v5	MPS	27 epochs (~55K steps)	0.5 best	—	Entropy collapse (PPO wrong algo)
v6a	MPS	452K steps	0 (all evals)	K/D=3.04	NoisyNet → 0% attack, KILLCOUNT bug
v6b	MPS	648K steps	0 (all evals)	K/D=1.66	KILLCOUNT bug, attack% dropping to ~6%

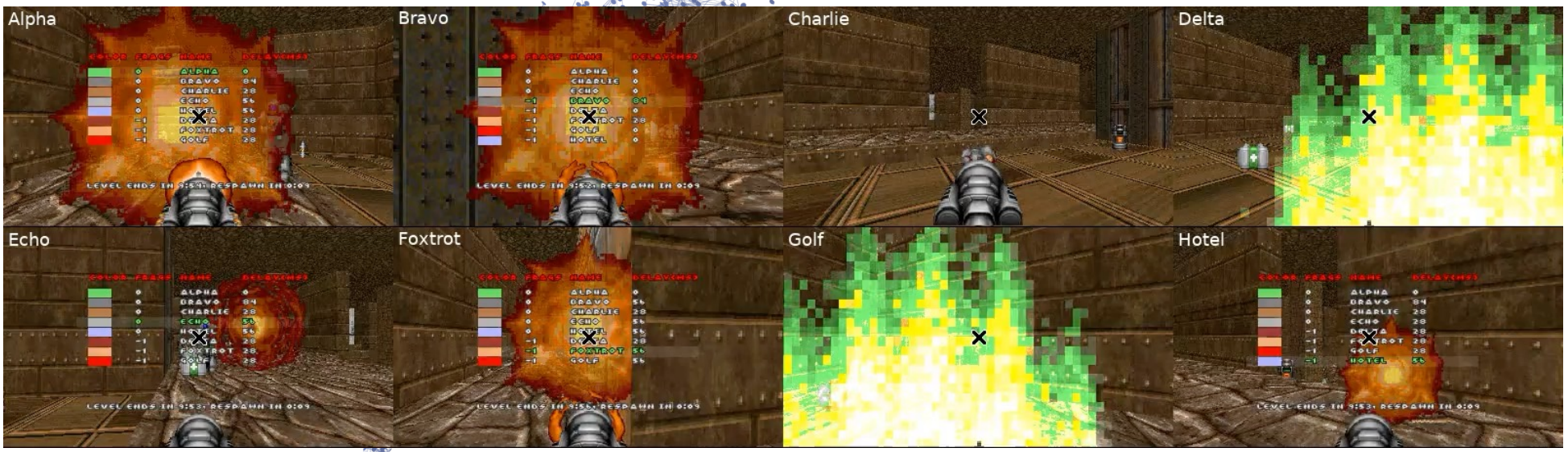
Doom Training Phases (Reward Based Chaos)



Results — BREAKTHROUGH

Metric	Value
Total Kills	110,248
Total Deaths	73,620
K/D Ratio	1.50
Best Eval Frags (5min)	39 ★
Recent Eval Frags	18–32 (stable)
Attack%	10–25% (context-appropriate)
Episodes	79,175
Gradient Updates	2,335,566

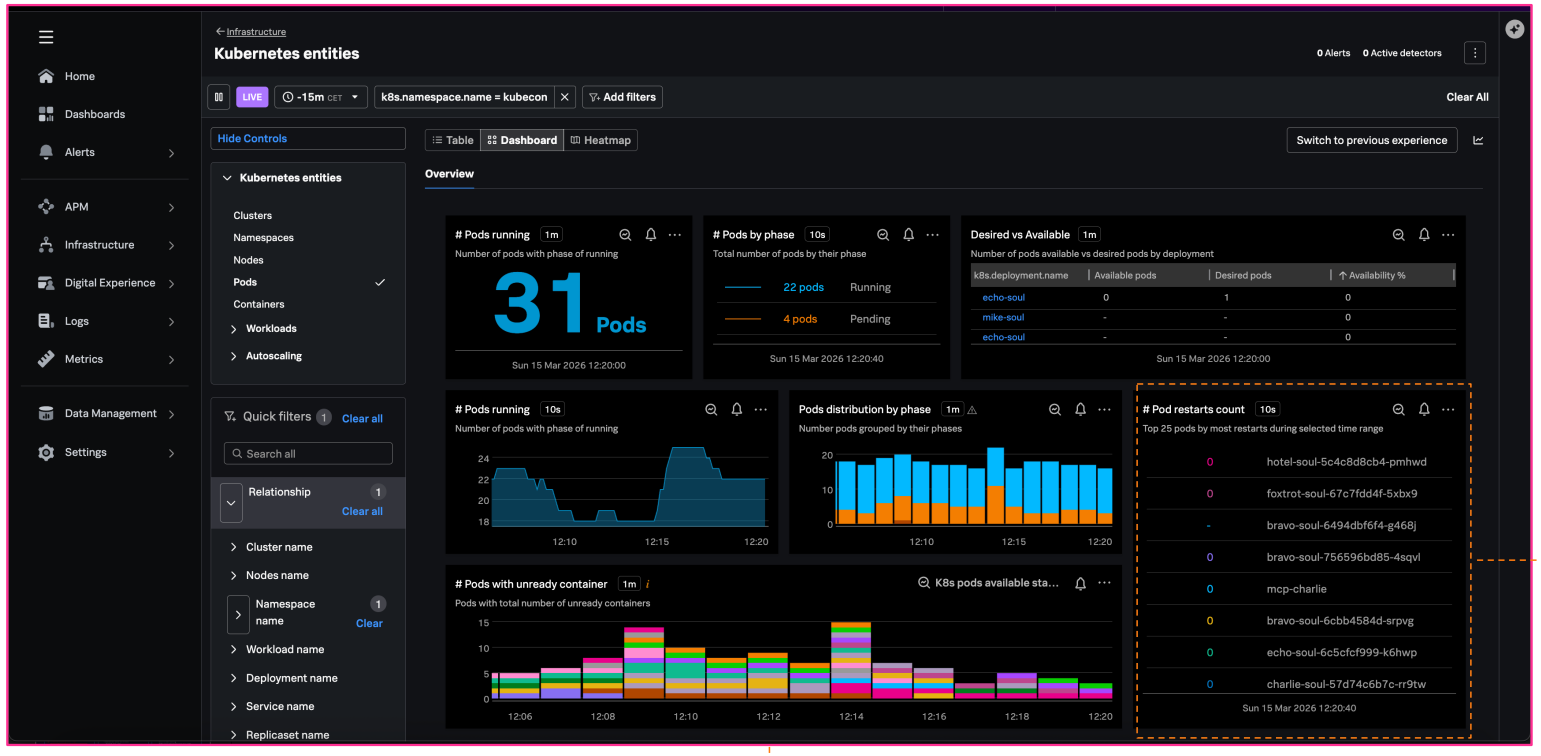
Doom Training Phases (Deathmatch 4x2)



Results — BREAKTHROUGH

Metric	Value
Total Kills	110,248
Total Deaths	73,620
K/D Ratio	**1.50**
Best Eval Frags (5min)	**39 ★**
Recent Eval Frags	18–32 (stable)
Attack%	10–25% (context-appropriate)
Episodes	79,175
Gradient Updates	2,335,566

Telemetry Integration (Deathmatch)



Player Soul Restarts

Pod health over time

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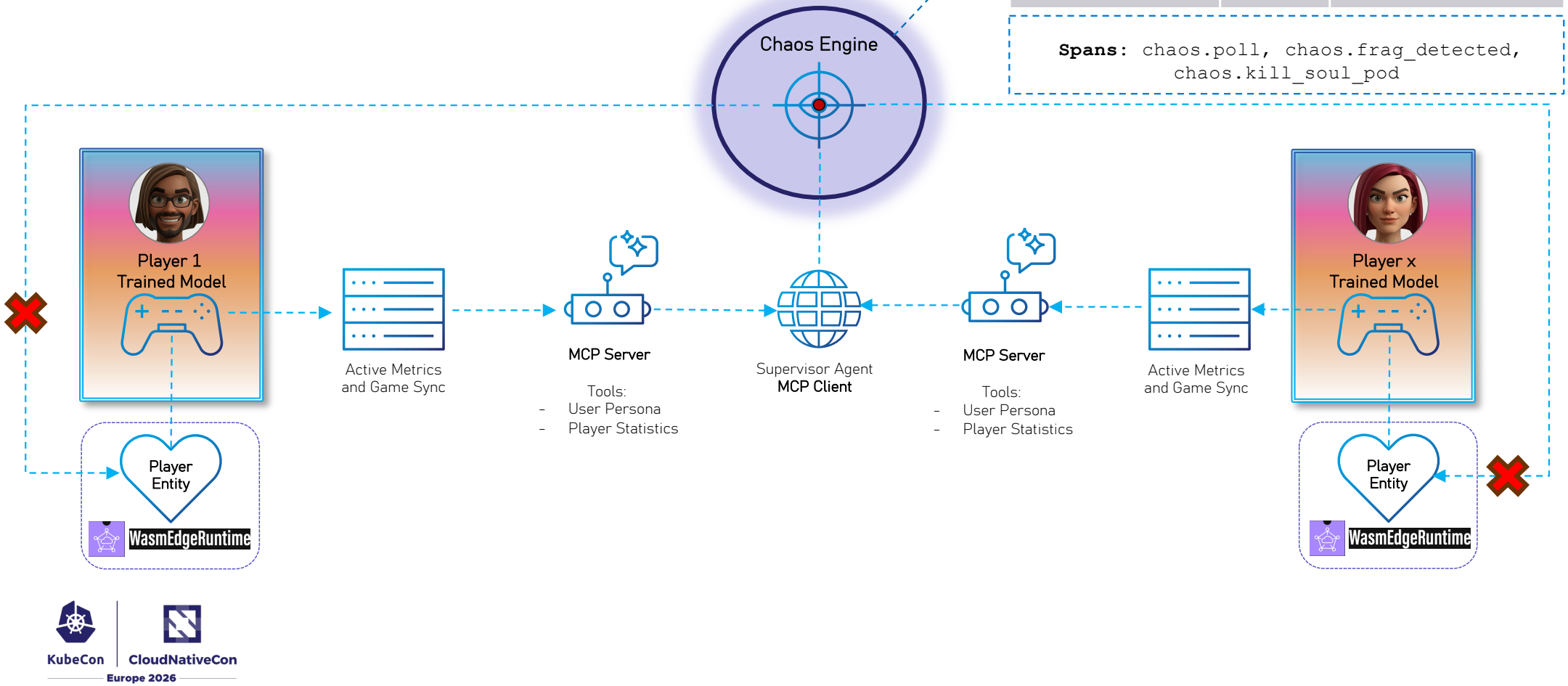
Chaos Engine



Chaos Engine

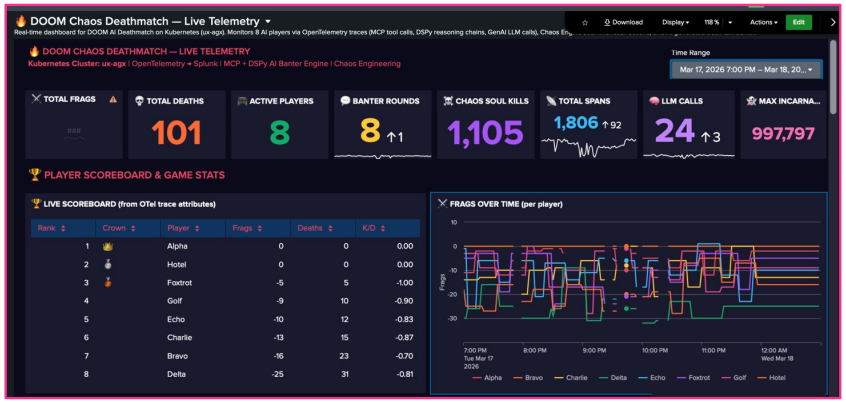
Metric	Type	Description
chaos.kills_triggered	Counter	Soul pod killed
chaos.poll_cycles	Counter	Supervisor poll cycles completed
chaos.active_souls	Gauge	Currently active soul pods

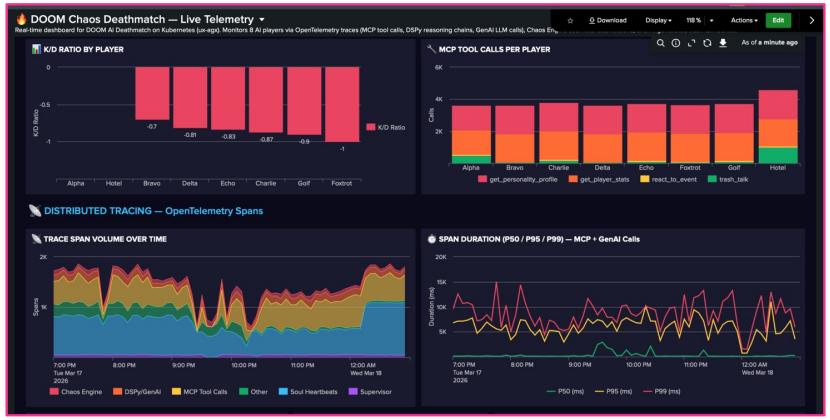
Spans: `chaos.poll, chaos.frag_detected, chaos.kill_soul_pod`

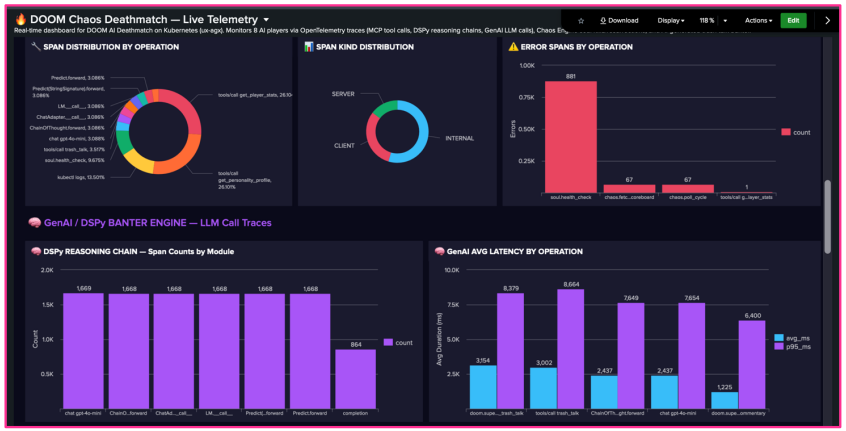


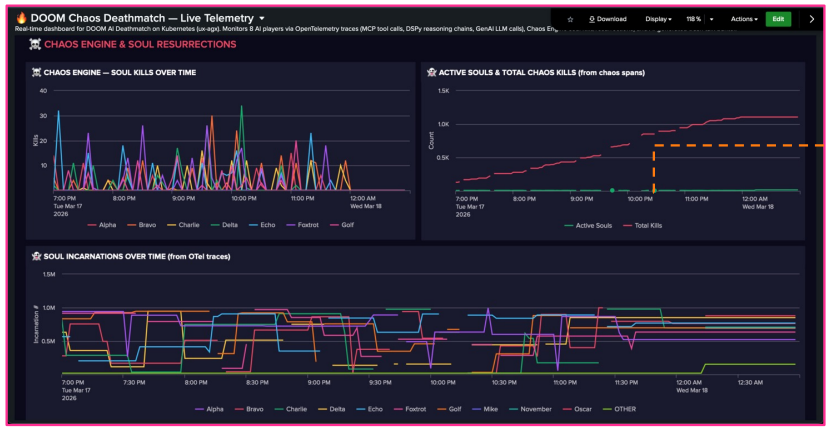
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Chaos Gameplay Dashboard









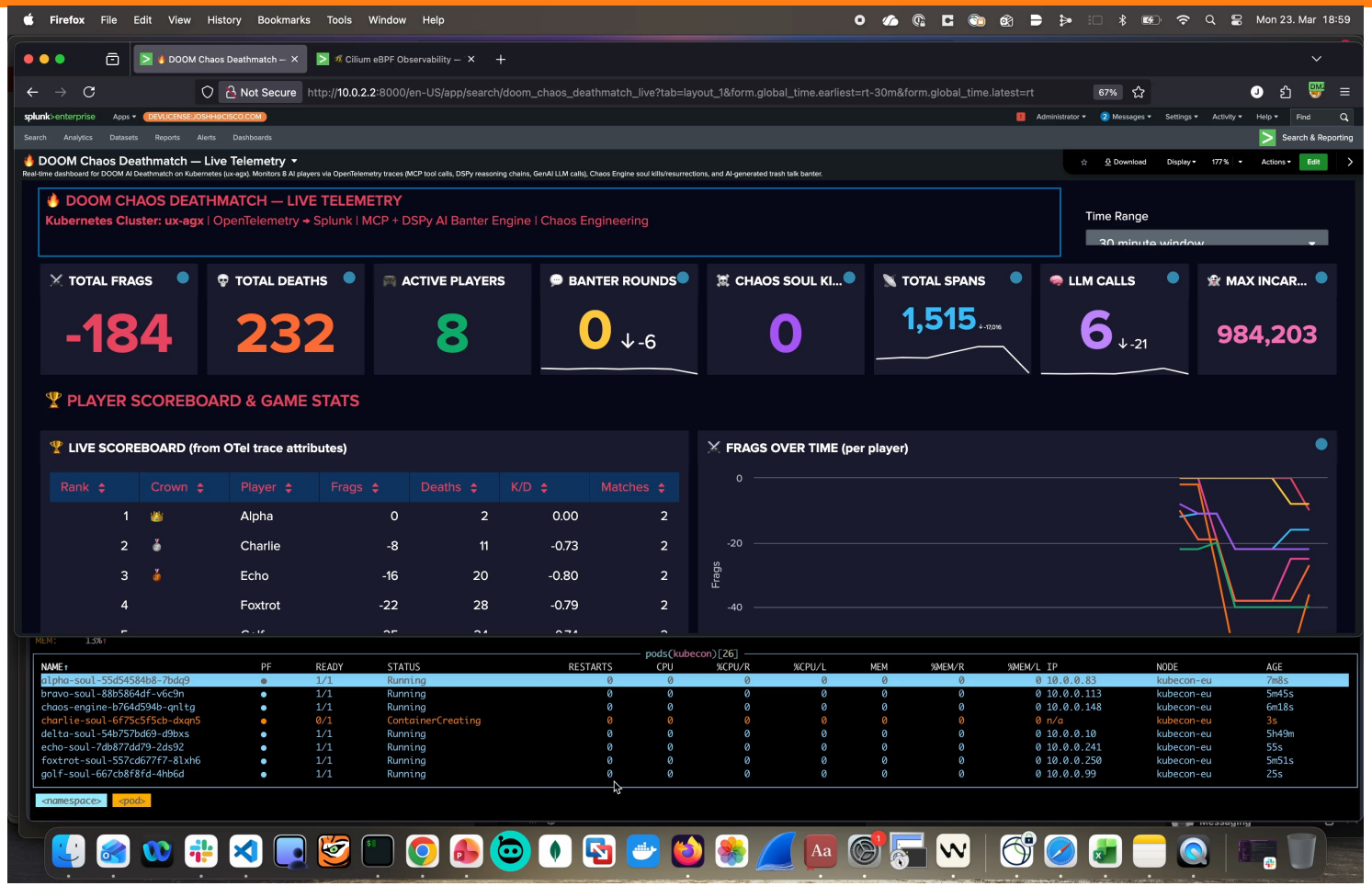
WASM Soul Restarts

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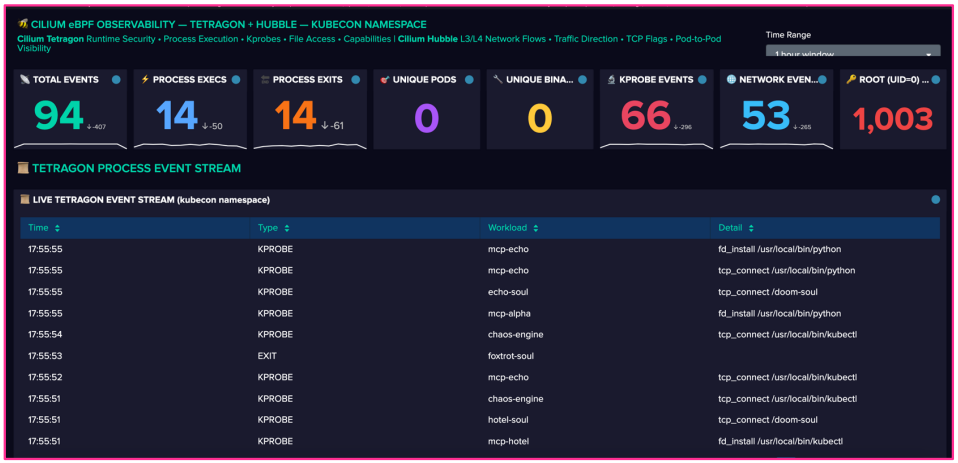
Chaos Mapped Game Pods

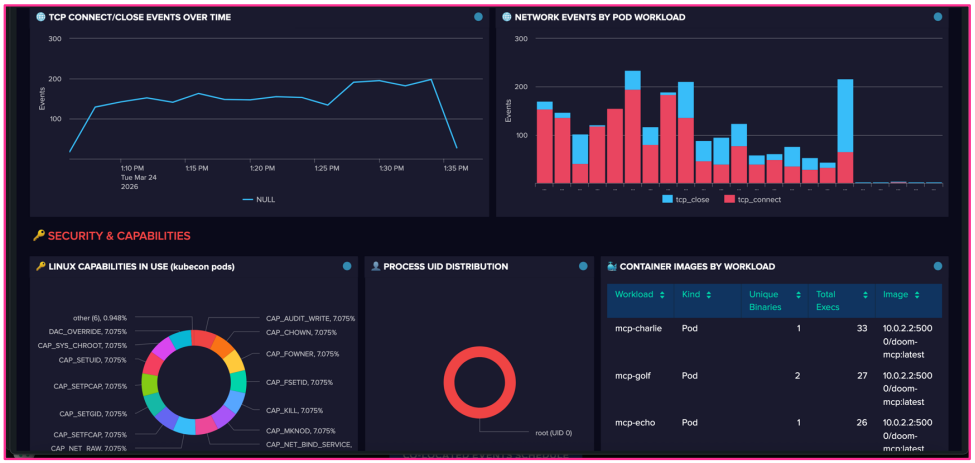
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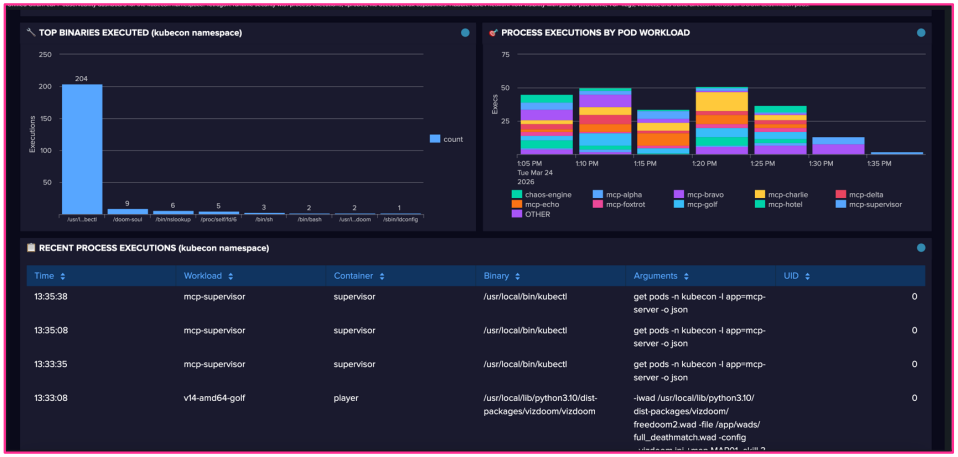
Video Recording:

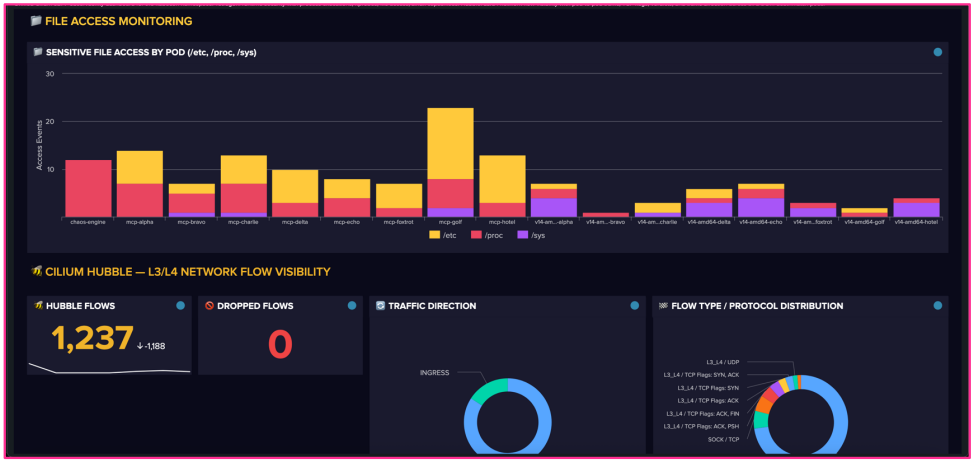


eBPF Hubble / Tetragon Dashboard







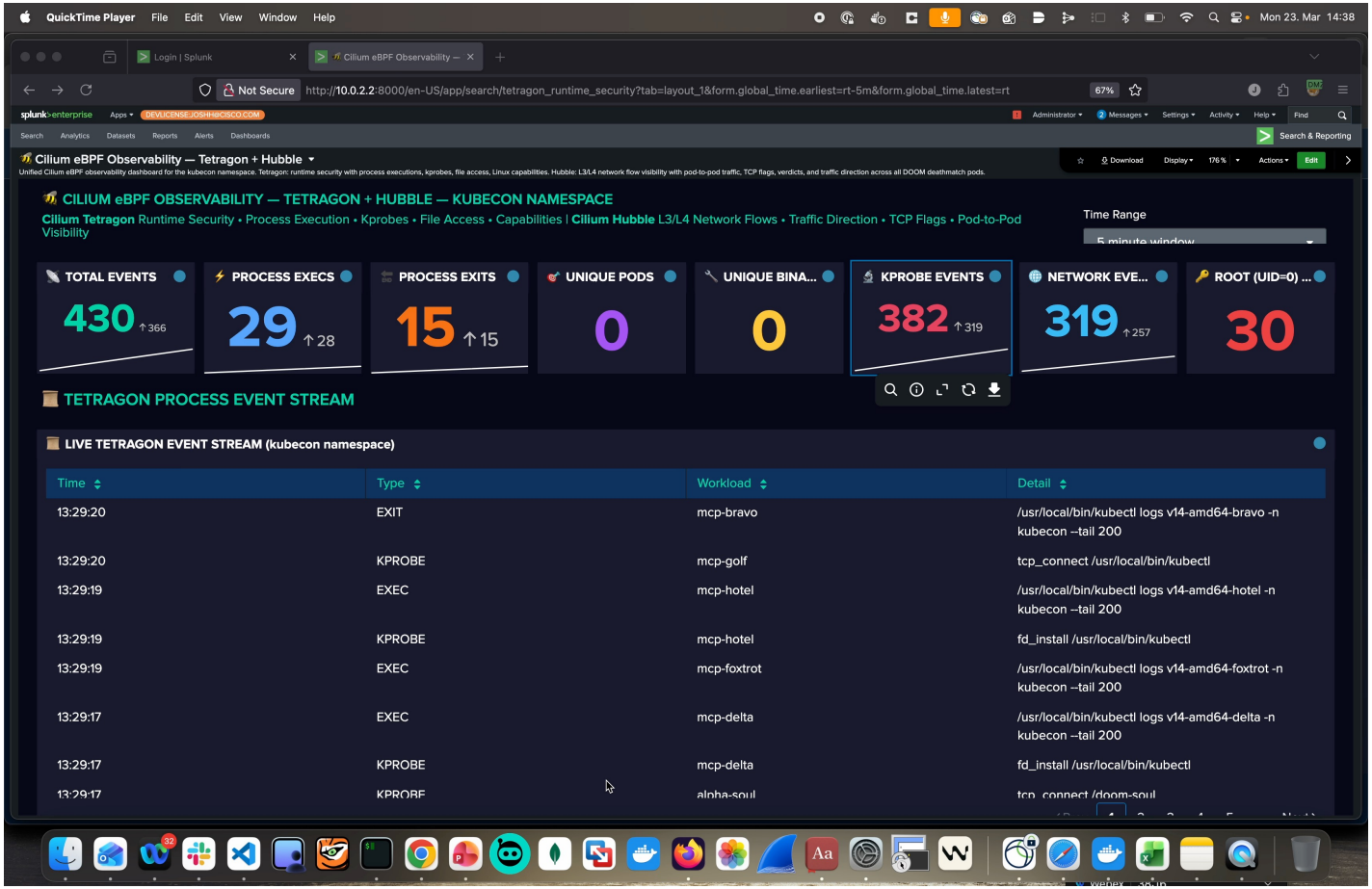


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Chaos Mapped Process / Traffic

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Video Recording:

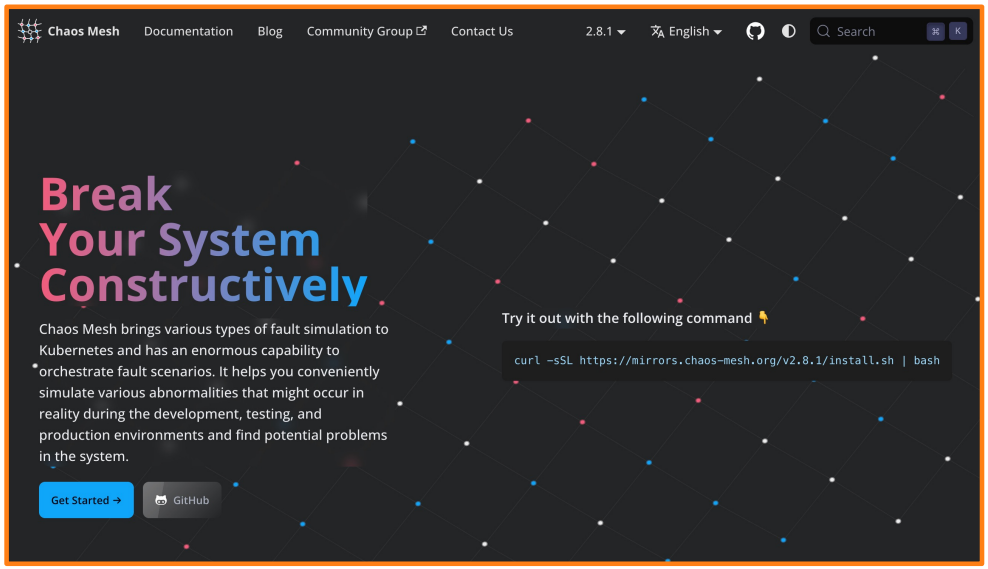


Open Source Chaos Engineering Tools

➤ Chaos Mesh (CNCF)

INCUBATING

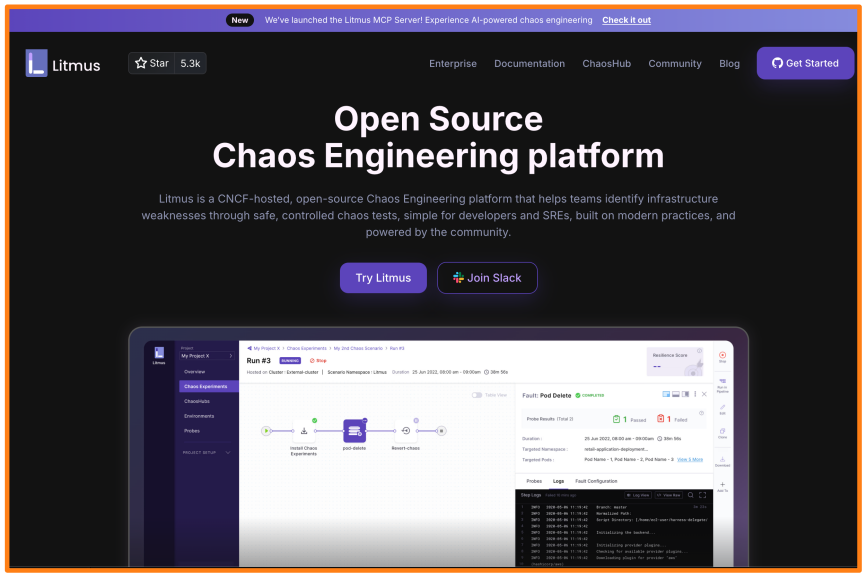
https://github.com/chaos-mesh/chaos-mesh



➤ Litmus (CNCF)

INCUBATING

https://github.com/litmuschaos/litmus



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Key Takeaways

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- Model Training can be tough
- Observability really helps in understanding performance
- **Explainability requires a <u>cradle to grave</u> perspective**
- Metric Driven Design ?
- AI in production demands hyper-resilience – observability is criticial

Good, Bad or Ugly??

Let us know!


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