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NATS Project Update

Derek Collison



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NATS is a **simple**,
production proven,
cloud-native
messaging system.

What is NATS?



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- ✓ Scalable Services and Streams
- ✓ At-Most-Once and At-Least-Once QoS
- ✓ Routing on Subjects/Topics, not IP or Hostnames
- ✓ Proven High-Performance Publish/Subscribe Router
- ✓ Simple, Secure, Performant and Resilient
- ✓ Built from the ground up to be Cloud-Native
- ✓ Support for over 30 different client languages
- ✓ Production-Proven for over 9 Yrs

Sample of NATS Clients



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nats.go

GoLang client for NATS, the cloud native messaging system.

go golang microservices nats cloud-native

Go ★ 2,265 🍴 303 📄 Apache-2.0 3 issues need help Updated a day ago



nats.rb

Ruby client for NATS, the cloud native messaging system.

ruby client messaging cncf pubsub nats eventmachine

Ruby ★ 823 🍴 131 📄 Apache-2.0 Updated a day ago



nats.java

Java client for NATS

java client middleware messaging nats messaging-library

Java ★ 194 🍴 68 📄 Apache-2.0 Updated a day ago



nats.ex

Elixir client for NATS, the cloud native messaging system. <https://nats.io>

client elixir nats nats-io

Elixir ★ 33 🍴 11 📄 MIT 1 issue needs help Updated 6 days ago



nats.js

Node.js client for NATS, the cloud native messaging system.

JavaScript ★ 672 🍴 96 📄 Apache-2.0 Updated 8 days ago



nats.net

The official C# Client for NATS

client visual-studio csharp messaging message-bus pubsub

C# ★ 232 🍴 63 📄 Apache-2.0 3 issues need help Updated 2 days ago



nats.c

A C client for NATS

c messaging message-bus message-queue messaging-library

C ★ 139 🍴 45 📄 Apache-2.0 Updated 7 days ago



nats.py

An asyncio based Python 3 client for NATS

aiο nats python3 asyncio cloud-native aio-nats

Python ★ 187 🍴 34 📄 Apache-2.0 Updated 4 days ago



Some NATS Users



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Use Cases



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- Cloud Messaging
 - ✓ Services (microservices)
 - ✓ Event/Data Streaming (observability, analytics)
 - ✓ Command and Control
- IoT and Edge
 - ✓ Telemetry / Sensor Data / Command and Control
- Augmenting or Replacing Legacy Messaging

User Testimonials



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With Choria.io, a user can be up and running with a scalable, clustered, secure orchestration system within 30 minutes. Out of the box it's known to support 50,000 nodes on a single compute node while being secure by default, easy to maintain and production ready, all powered by NATS.

User Testimonials



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Netlify, the leading platform for deploying high performance websites and applications, utilizes NATS as the ultra-fast data plane for their services spanning several cloud providers and supporting over 500,000 developers and businesses.

User Testimonials

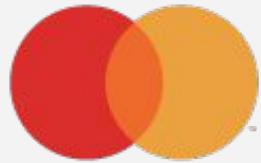


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mastercard.

Mastercard is leveraging NATS to transition from a legacy system to a next generation cloud based infrastructure and has been providing valuable input for new NATS features related to security, tracing, bridging, and configuration.

User Testimonials



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StorageOS leverages NATS as a reliable control plane to transmit critical system level events like volume creation and deletion between nodes in their persistent storage for containers.

User Testimonials



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Tinder migrated to NATS from a poll based system to allow push notifications to their users, increasing scalability, and reducing mobile network bandwidth usage.

User Testimonials



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Platform9 created Fission.io, a framework for “Serverless” Functions or Functions-as-a-Service on Kubernetes which uses NATS for event sourcing. NATS was chosen over other messaging projects for it's reliability and ease of use.

User Testimonials



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Qlik's Qlik Sense is a Cloud Native data analytics platform built on Kubernetes that provides a rich analytics user experience to thousands of users. Qlik Sense uses NATS to broadcast messages to facilitate data synchronization, workload queues, and cache invalidation as well as help provide monitoring and auditing of the system as a whole, as well as handling our custom authentication requirements.



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NATS Ecosystem

NATS Integrations



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- ✓ Simple curl command to install and deploy to Kubernetes
- ✓ Prometheus Exporters, Fluentd Plugin and OpenTracing/Jaeger support
- ✓ Dapr.io Component Integration
- ✓ Spring Boot Starter
- ✓ NATS Cloud Stream Binder for Spring
- ✓ NATS / Kafka Bridge
- ✓ NATS / MQSeries Bridge
- ✓ Go-Cloud and Go-Micro pub/sub integration



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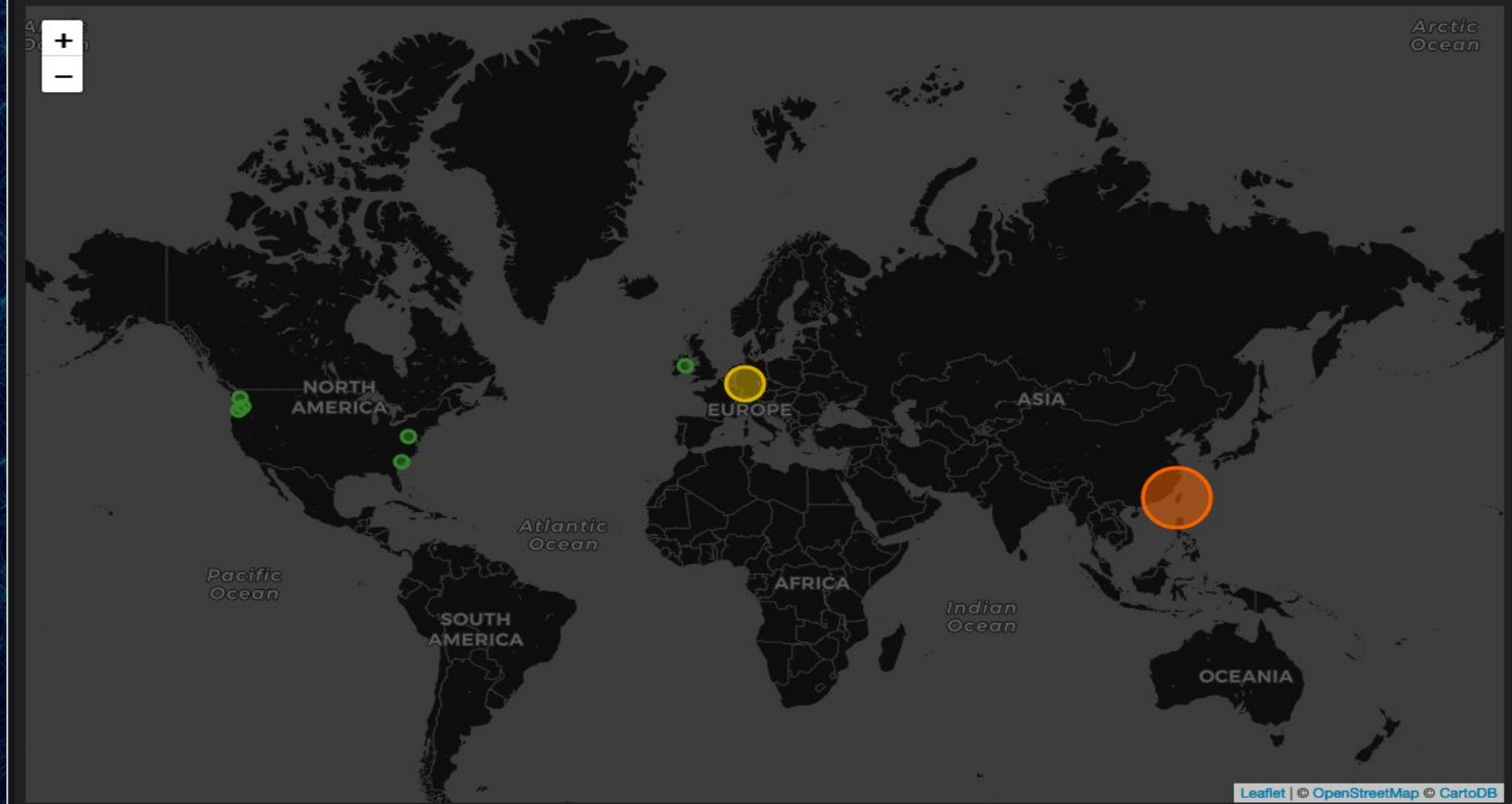
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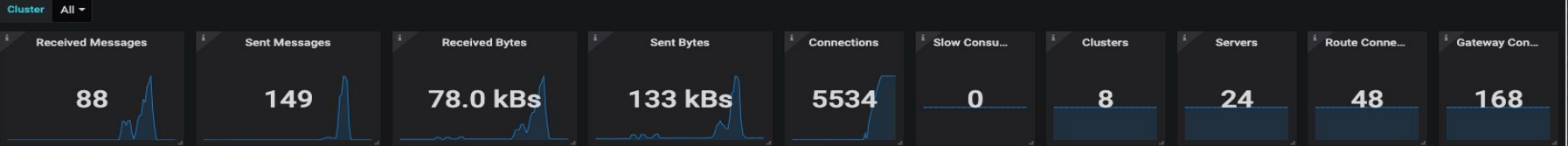
NATS Monitoring

Global Dashboard

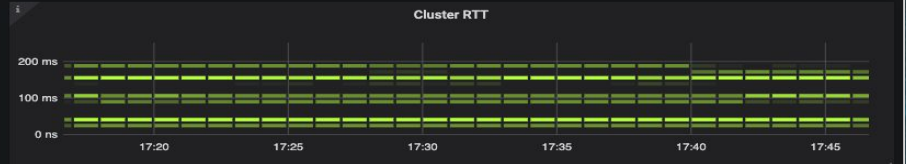
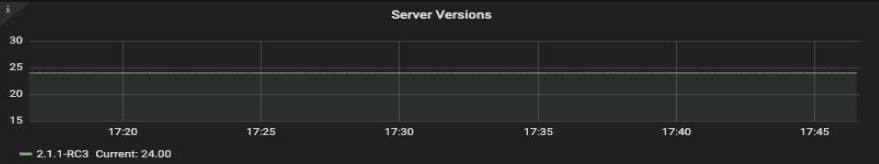
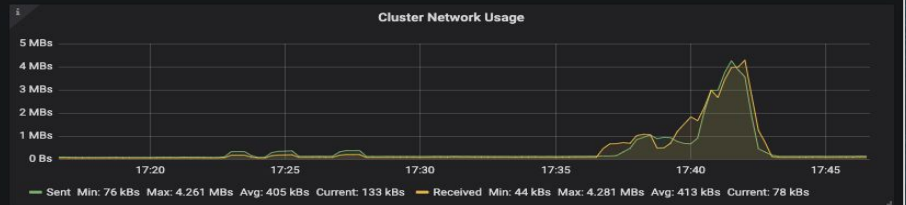
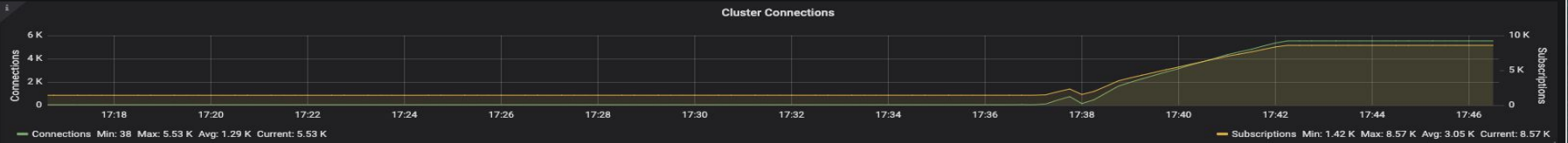
NATS Connections ▾



SuperCluster Metrics

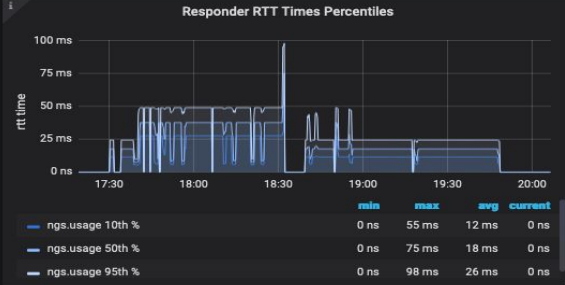
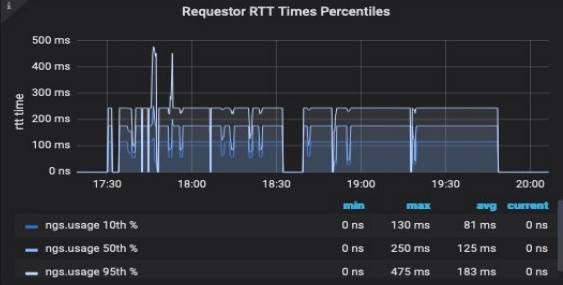
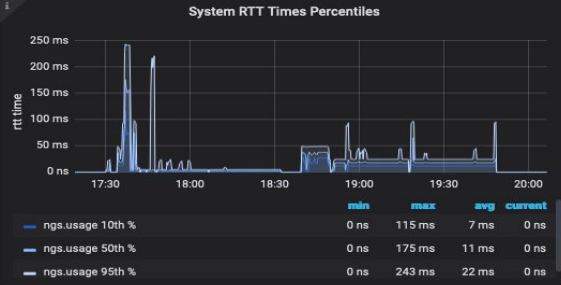
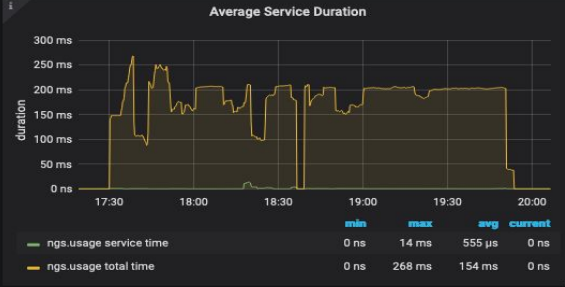
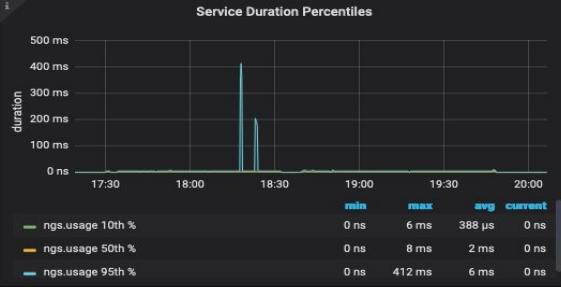


Cluster Overview



Service Latency - Global View

Service ngs.usage Range 1m





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NATS Getting Started

Basic Messaging Patterns



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Services - Request/Reply

- ✓ Scale Up and Down
- ✓ Location Transparency
- ✓ Observability

Streams - Events and Data

- ✓ Scalable N:M communications
- ✓ Realtime and Persisted
- ✓ Playback by time, sequence, all or only last received

Accessing a NATS System



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- ✓ Free Community Servers
 - `demo.nats.io` (both open and secure versions)
- ✓ Kubernetes
 - `curl https://nats-io.github.io/k8s/setup.sh | sh`
- ✓ Docker
 - `docker run -p 4222:4222 -ti nats:latest`
- ✓ Additional Information
 - `https://docs.nats.io/nats-server/installation`



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Building Services with NATS

HTTP vs NATS (Requestor)



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```
resp, err := http.Get("http://example.com/")
if err != nil {
    // handle error
}
defer resp.Body.Close()
body, err := ioutil.ReadAll(resp.Body)
// decode body
```

HTTP vs NATS (Requestor)



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```
nc, err := nats.Connect("demo.nats.io")
if err != nil {
    // handle err
}
resp, err := nc.Request("example.com", nil, 2*time.Second)
// decode resp.Data
```

HTTP vs NATS (Service)



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```
http.HandleFunc("/bar", func(w http.ResponseWriter, r *http.Request){
    fmt.Fprintf(w, "Hello World")
})

log.Fatal(http.ListenAndServe(":8080", nil))
```

HTTP vs NATS (Service)



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```
nc, err := nats.Connect("demo.nats.io")
if err != nil {
    // handle err
}
sub, err := nc.QueueSubscribe("bar", "v0.1", func(m *nats.Msg) {
    m.Respond([]byte("Hello World"))
})
```

NATS Service



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- ✓ Deploy to any cloud, any geo, any deployment framework
- ✓ On-premise, Cloud, Edge or IoT
- ✓ No load balancers required
- ✓ No DNS updates to launch service
- ✓ No config changes to scale up or down
- ✓ Transparent service latency tracking (3 points of reference)



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NATS History



NATS started as a project to power CloudFoundry

- ✓ Command and Control
- ✓ Querying
- ✓ Telemetry and Events
- ✓ Location Transparency
- ✓ Addressing and Discovery
- ✓ Distributed Scheduler
- ✓ Highly Resilient and Self Healing

NATS “then”



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Built for me to serve

CloudFoundry and BOSH

control planes and telemetry system.

NATS “now”



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Be the **enabling** technology to securely connect ALL the world's digital systems, services and devices.

Connect Everything



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- ✓ Shared utility of any size
- ✓ Decentralized and Federated
 - Mix a shared utility with your own servers and security
- ✓ Secure by default, no passwords or keys, powerful authorization
- ✓ On-Premise, Multi-Cloud, Multi-Deployment, the Edge, and IoT
- ✓ Communicate, Publish, Consume, and Save and Restore State
- ✓ Healthy and thriving Ecosystem of Services and Streams



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NATS Community

Contribution and Project Velocity



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- ✓ Over 1,000 contributors, over 100 with more than 10 commits
- ✓ 33 Client Languages, most from outside contributors
- ✓ 15,000+ GitHub stars across repos
- ✓ 75 Public Repos
- ✓ **100M** NATS Server and Streaming Server Docker Downloads
- ✓ ~1,600 Slack Members and accelerating
- ✓ 20+ releases of the NATS server since June 2014, ~= 5/yr

<https://nats.devstats.cncf.io/d/9/developers-summary>

Last 2.5 Years



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- ✓ Designed PKI/JWT security for AuthZ and AuthN (w/ instant revocation)
 - **NO** private keys transmitted or store on any NATS server
- ✓ Move to a secure multi-tenant distributed design, “containers for messaging”
- ✓ Additional Network Topologies
 - Gateways for global superclusters
 - Leafnodes to extend a NATS system with your own servers and auth
- ✓ Dynamic Response Authorization
- ✓ Transparent Service Latency Tracking
- ✓ All **NEW** Docs!



- ✓ Next generation persistent messaging
- ✓ Years in the design and implementation
- ✓ Built into every NATS server, works with all NATS clients
- ✓ Supports Streams, Message-Queues and Work-Queues
- ✓ Push and Pull modes for Consumers
- ✓ File and Memory backing stores
- ✓ Scales horizontally, no additional components required
- ✓ NATS 2.0 Native, multi-tenant and secure by default

What's Next?



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- ✓ IoT and Edge
- ✓ Native MQTT support
- ✓ Websocket support for mobile and web
- ✓ Webassembly support
 - Secure ingress and egress filtering and customization
 - JetStream filters and processing
- ✓ Additional Stateful services, K/V, etc.

Timeline



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2010

2012

2016

2019

2020

NATS first commit

Single Ruby Server and Client. No clustering or auth past single password for the whole system.

Go version released

Clustering. Performance increase from 150k msgs/sec to 6M msgs/sec.

NATS Streaming

Authorization enhancements. NATS.io site launched. Ecosystem start. More clients added.

NATS 2.0 / JetStream

CNCF - 2018. Multi-Tenancy, SuperClusters, Leafnodes, PKI/JWT based authN and authZ.

IoT, Edge & Mobile

MQTT support, Signed Webassembly support, Websockets support

Want to learn more?



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- ✓ 90 Minute Deep Dive Session on Thursday, 10:55am Room 6E
- ✓ Come by the Project Booth
- ✓ The `nats.io` website
- ✓ Docs! - `docs.nats.io`
- ✓ Slack Channel - `slack.nats.io`
- ✓ Email - `info@nats.io`



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Come join us!
Let's Connect Everything