PubNub

Everything you Wanted to Know about Serverless but Were Afraid to Ask

Containers, Functions-as-a-Service, and Event Architectures

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Emergence of the Streaming Web

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Every **hot trend** in the last five years has been enabled by **realtime** technology.

Sharing Economy

Connected Cars

eHealthcare

SmartHome

Machine Learning

Dating Apps

Chatbots

Social Applications

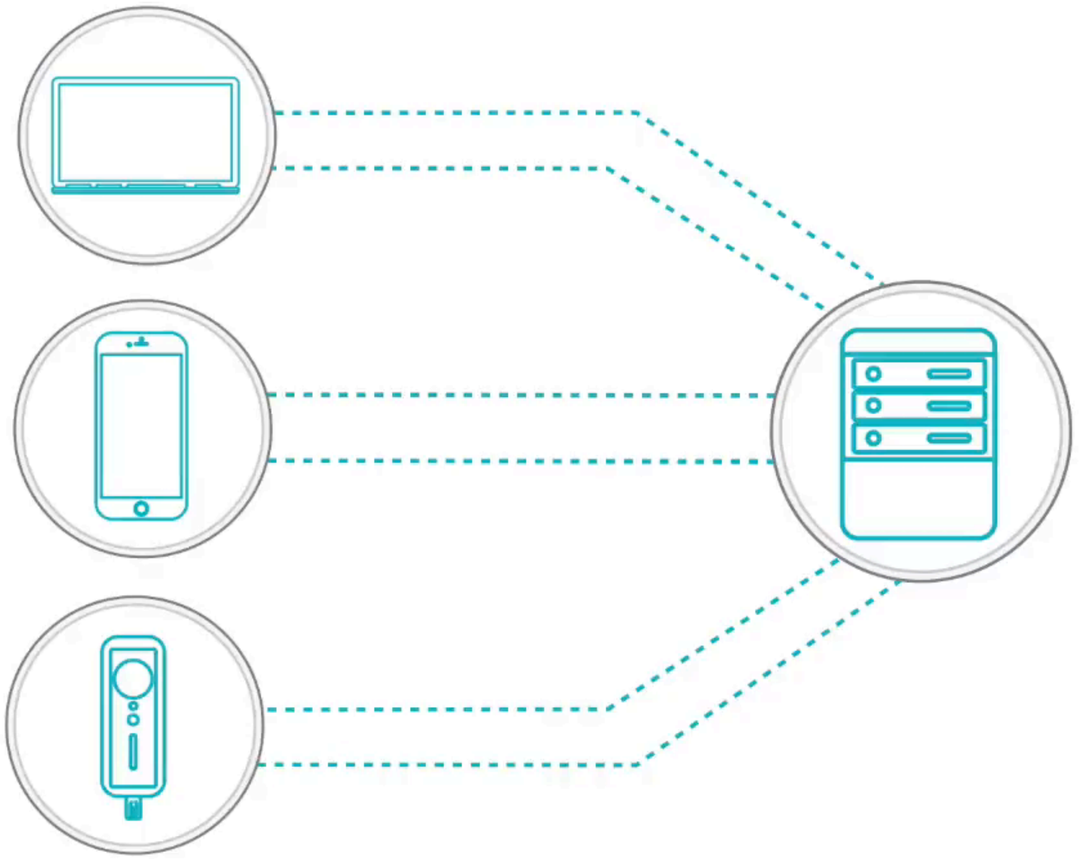
Audience Engagement

Business Collaboration

Delivery & Dispatch

PubNub

REST-based Architecture Moves to Streaming



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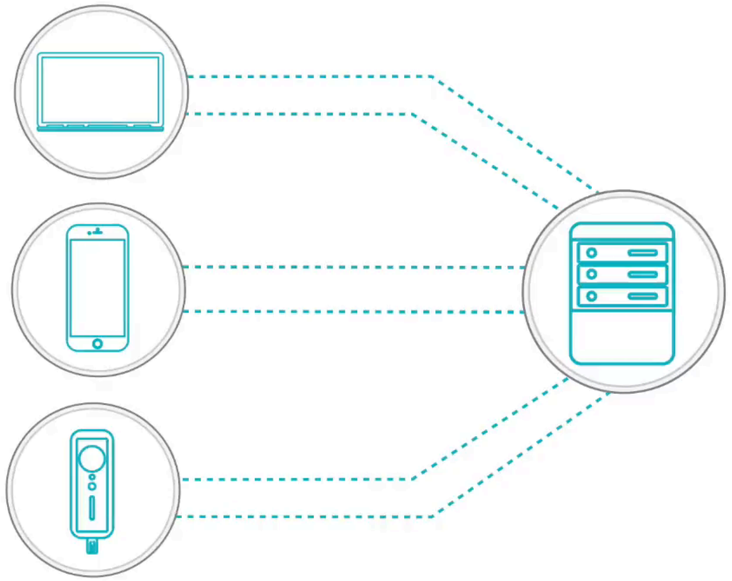
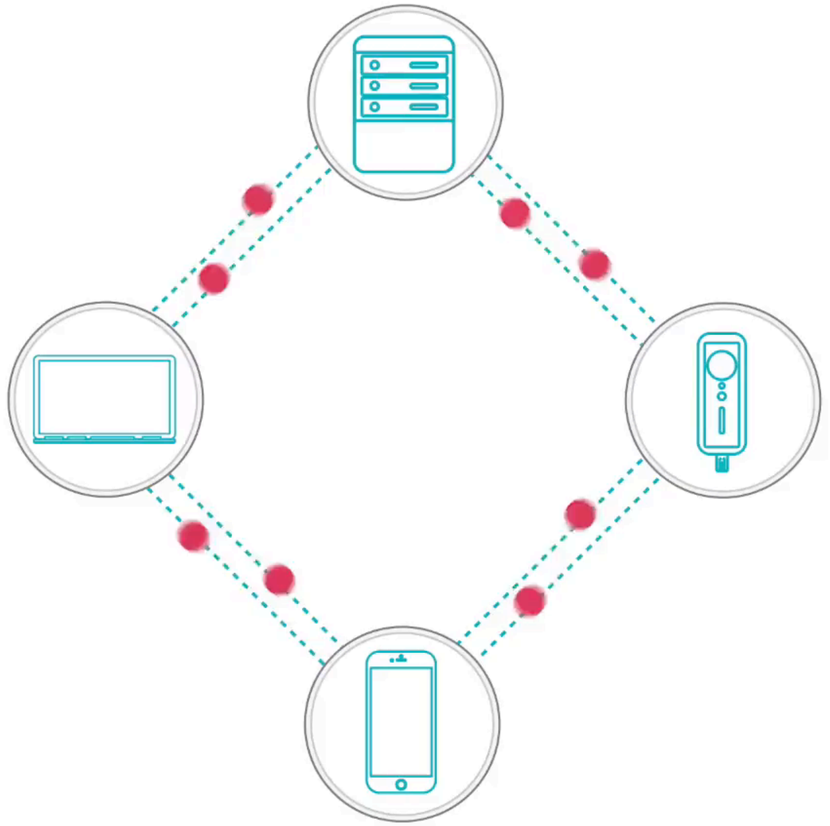
REST-based Architecture Moves to Streaming





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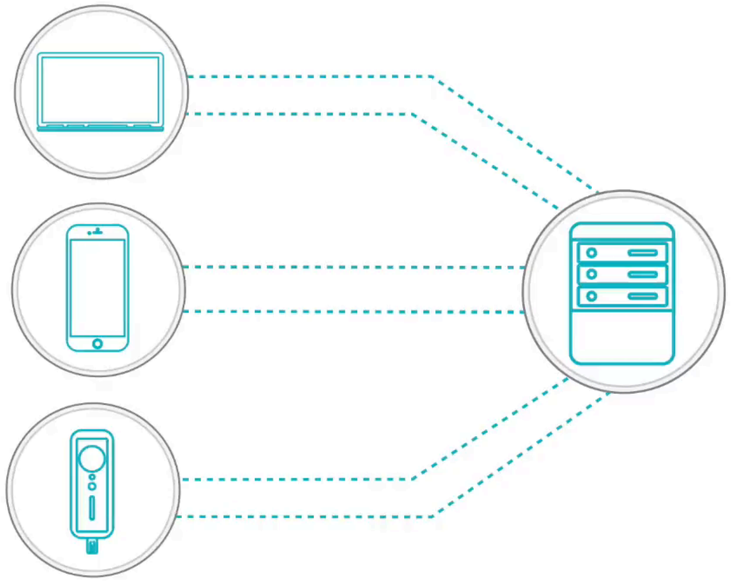
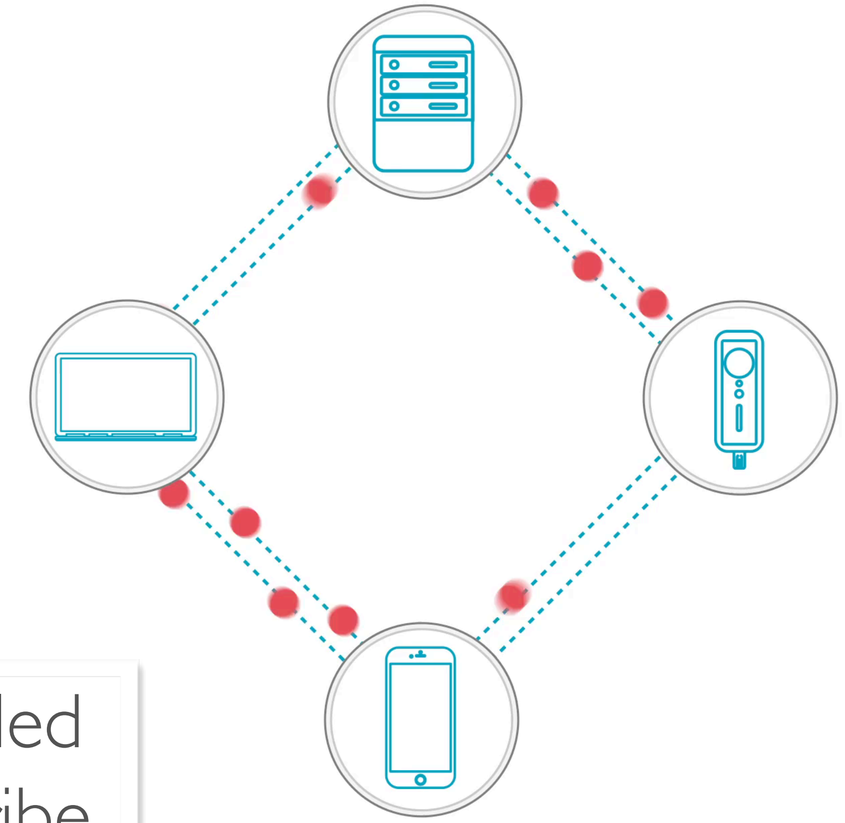
REST-based Architecture Moves to Streaming





- Loosely Coupled
- Publish/Subscribe
- Sockets & Polling

PubNub

Powering Thousands of Customers Globally

SOCIAL/ENTERTAINMENT

ESPN
Life360
PocketGems
PLUTO TV
GameStop POWER TO THE PLAYERS
DRAFTKINGS

IOT & SMART HOME

logitech
MONSANTO
ERICSSON
august
INSTEON
SAMSUNG
wink
Henkel

TRANSPORTATION & DELIVERY

Gett
GO-JEK
DELPHI
lyft
Metra The way to really fly.
JUSTEAT

HEALTHCARE & FINANCIAL SERVICES

SAP
athenahealth
Seeking Alpha
TD AMERITRADE
NewYork-Presbyterian
NurseGrid

ONLINE COLLABORATION

AUTODESK
RingCentral
ebay
DOMO
Adobe
yelp
SYMPHONY

AUDIENCE PARTICIPATION

Coca-Cola
BT Sport
McDonald's
YAHOO!
FAN hUb
Budweiser

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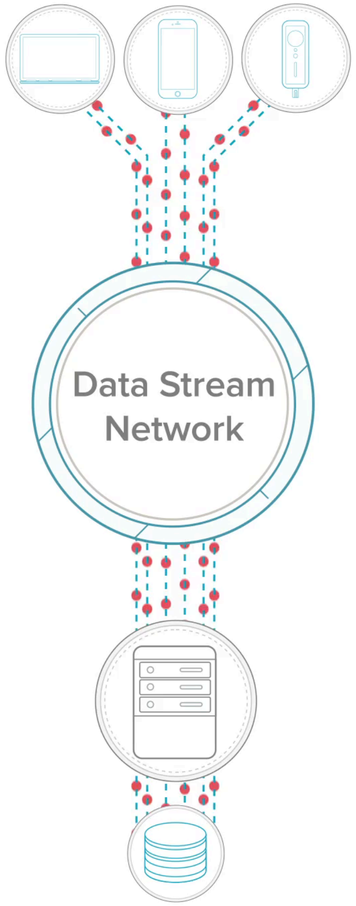
The Challenge of Business Logic for Realtime Apps



Traditional 3-Tier Architecture Doesn't Scale

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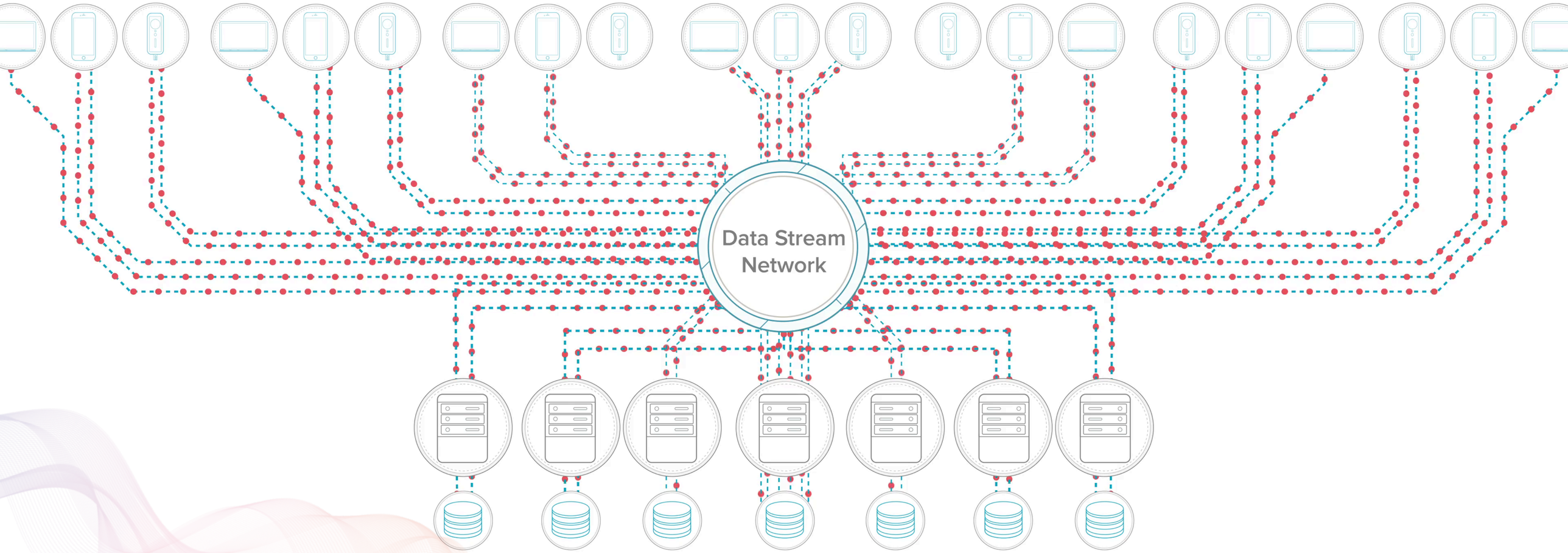
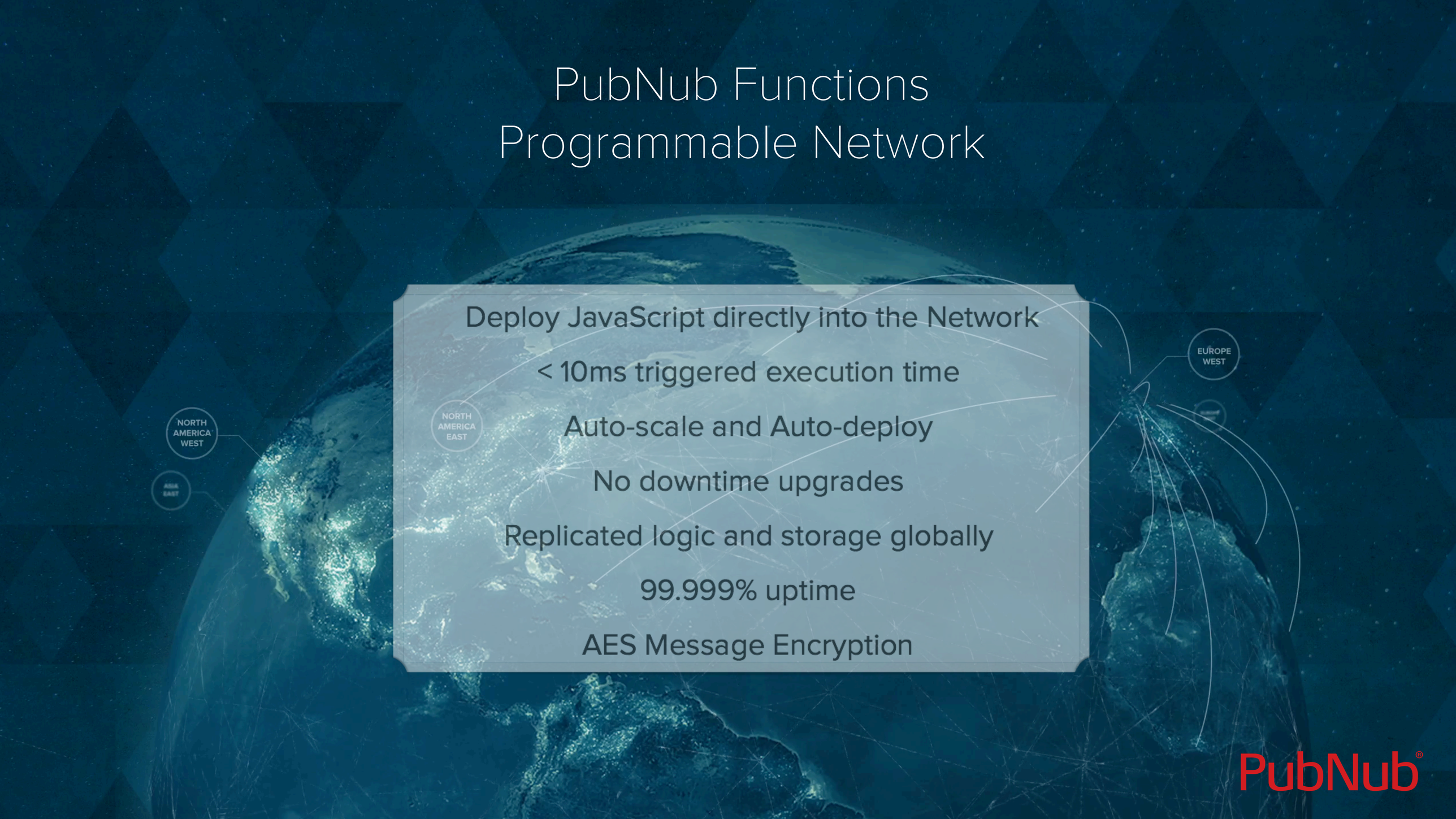
The Network is the Computer...



PubNub FUNCTIONS

PubNub Functions
Programmable Network



Deploy JavaScript directly into the Network

< 10ms triggered execution time

Auto-scale and Auto-deploy

No downtime upgrades

Replicated logic and storage globally

99.999% uptime

AES Message Encryption

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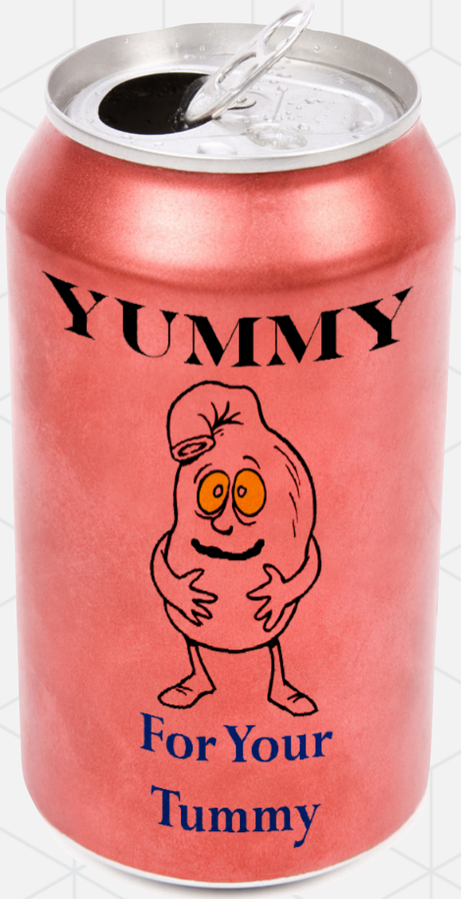
Solving the Yummy Soda Conundrum



```
1.
2.
3.
request.message.chat =
    request.message.chat.replace
        (/gunk/gi, "Yummy");
```

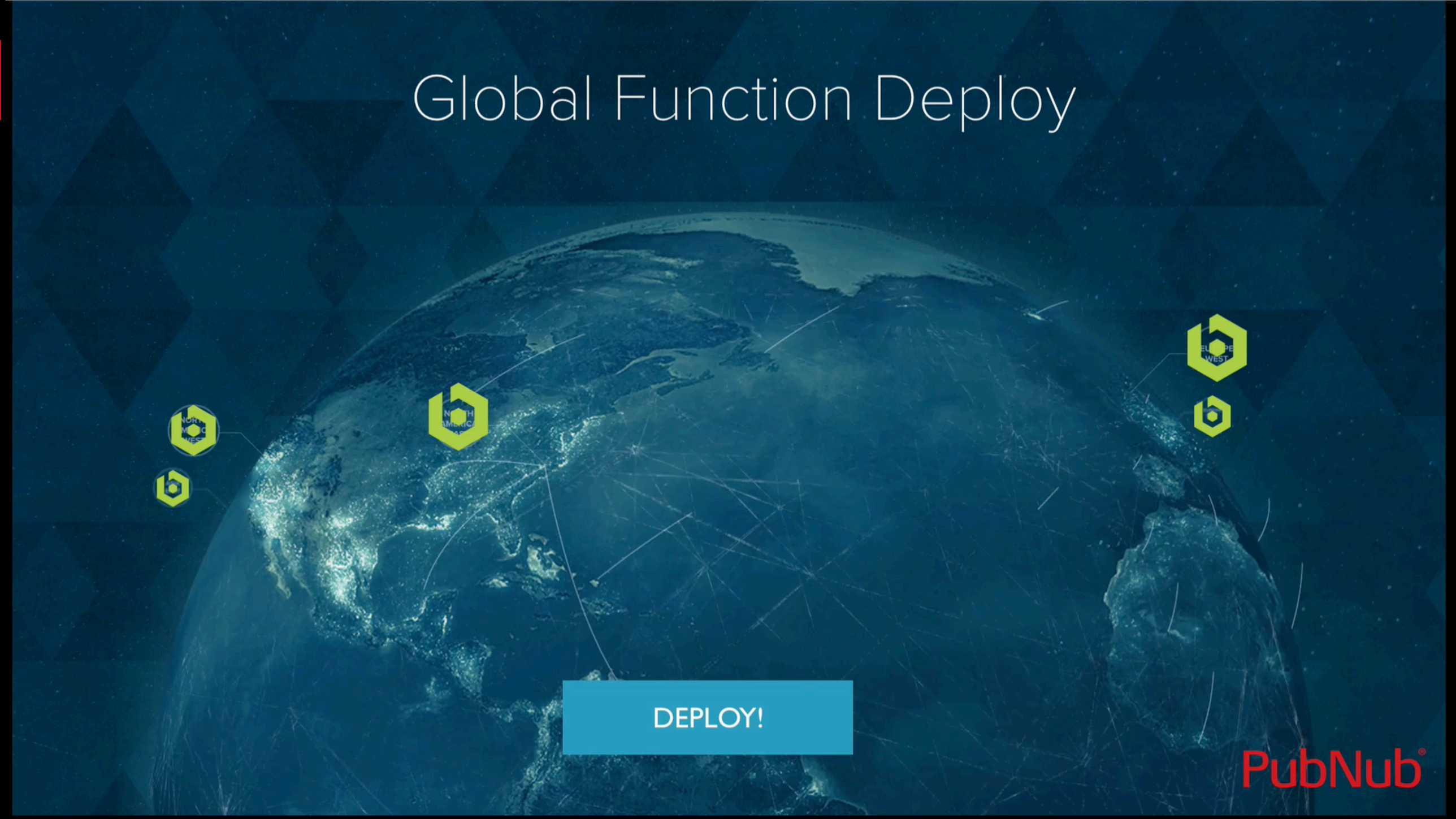
DEPLOY!

Solving the Yummy Soda Conundrum

```
request.message.chat =
    request.message.chat.replace
        (/gunk/gi, "Yummy");
```

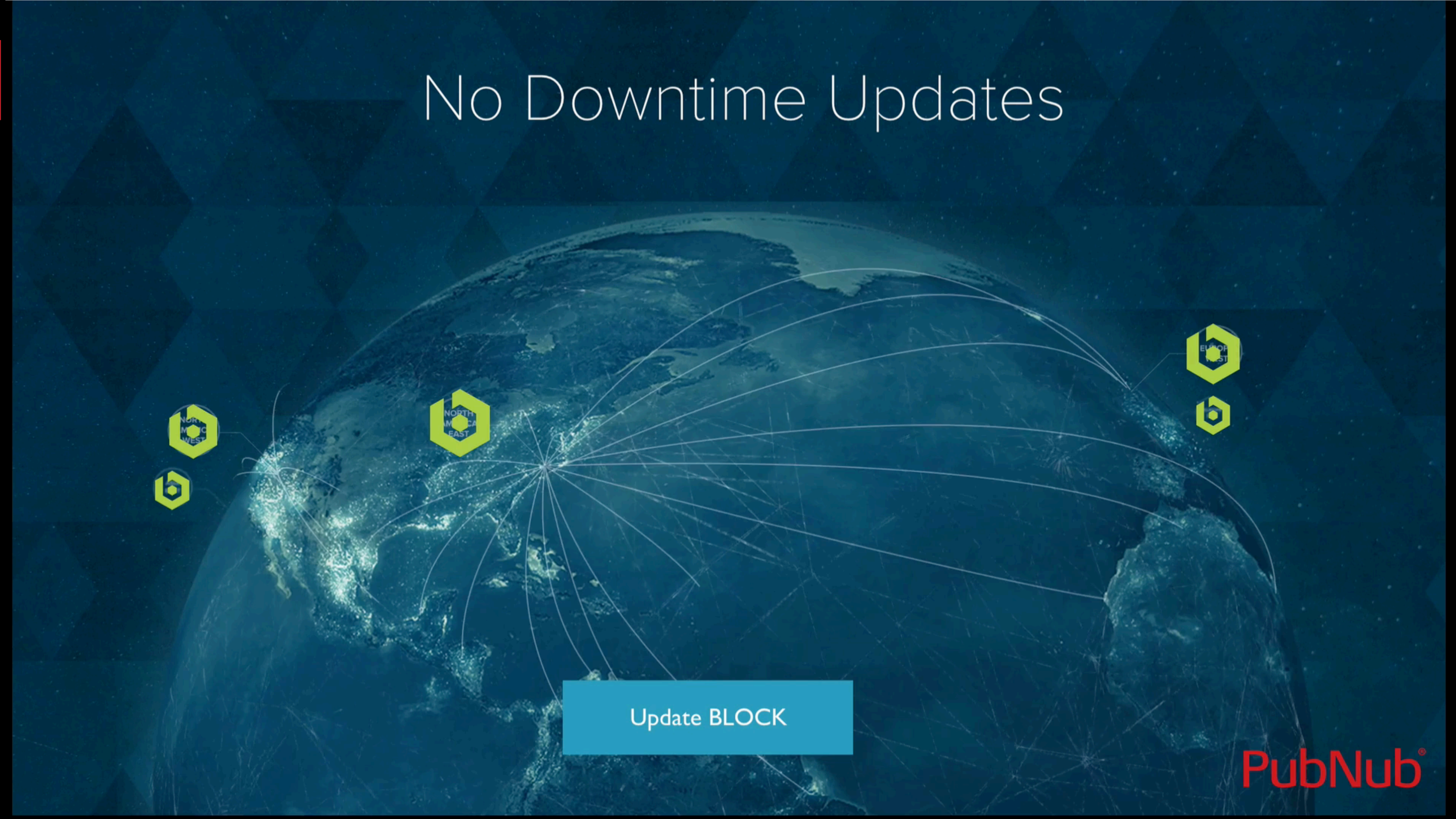
DEPLOY!

Global Function Deploy



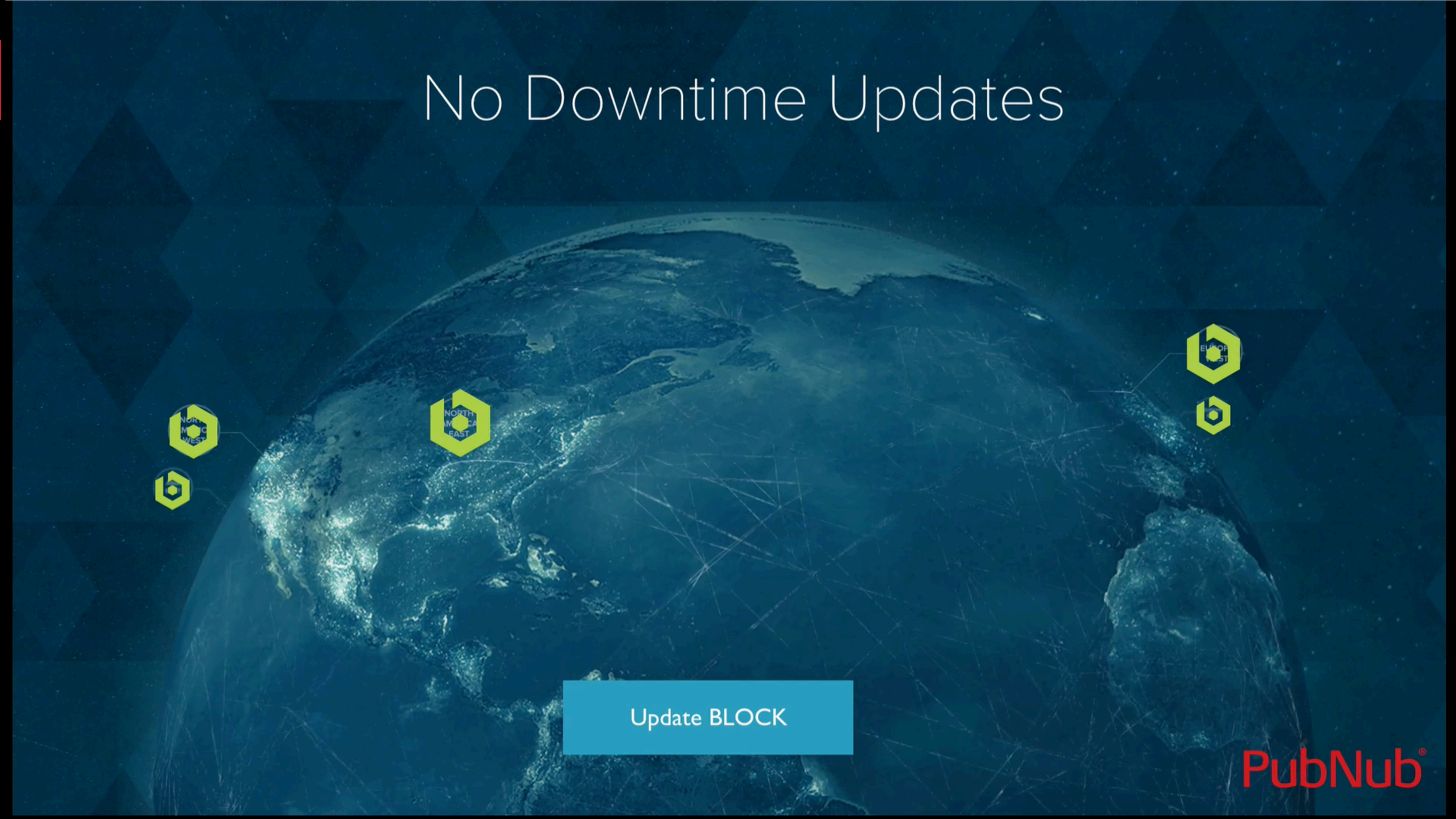
PubNub®

No Downtime Updates



PubNub®

No Downtime Updates



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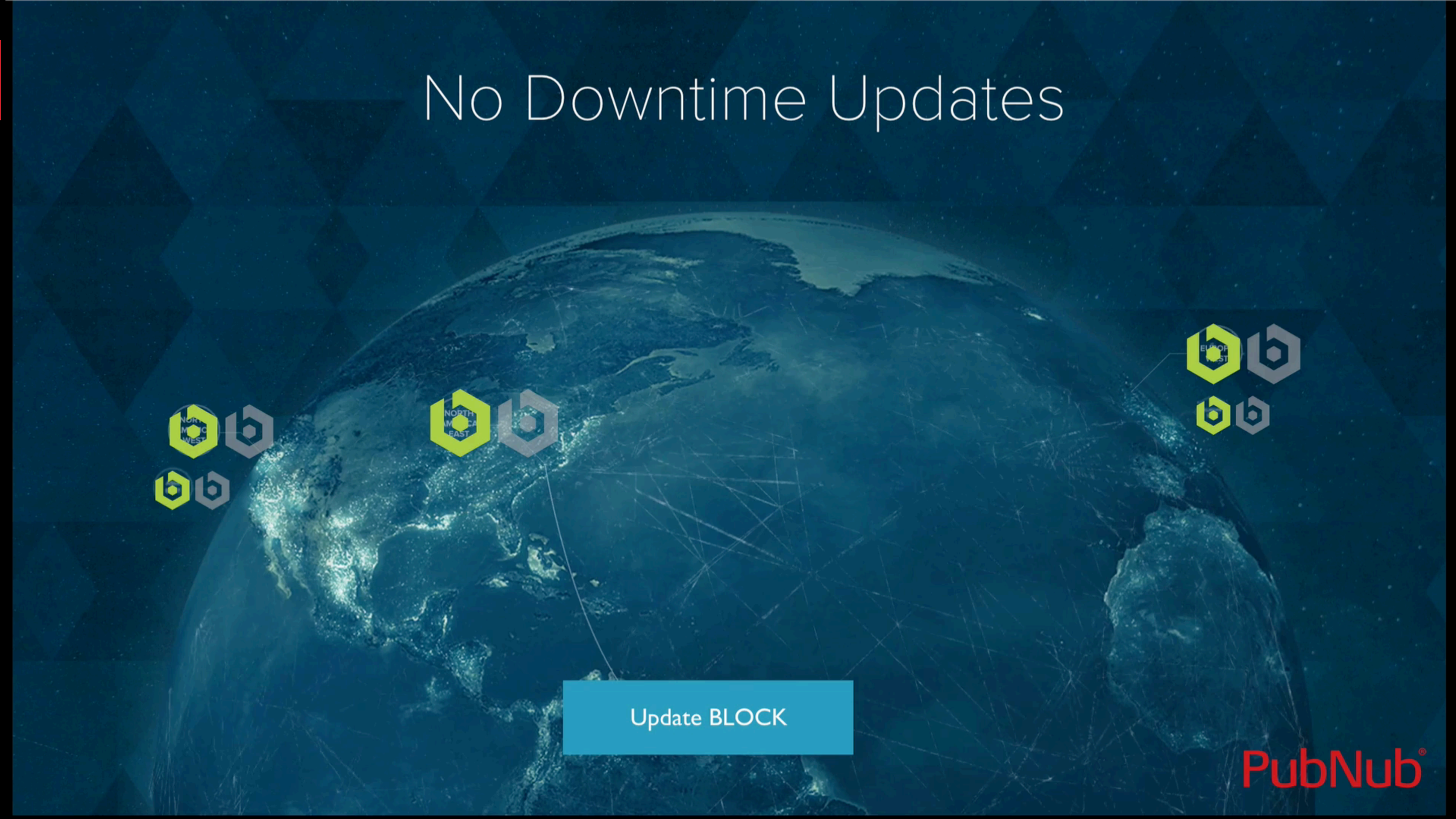

PubNub®

No Downtime Updates

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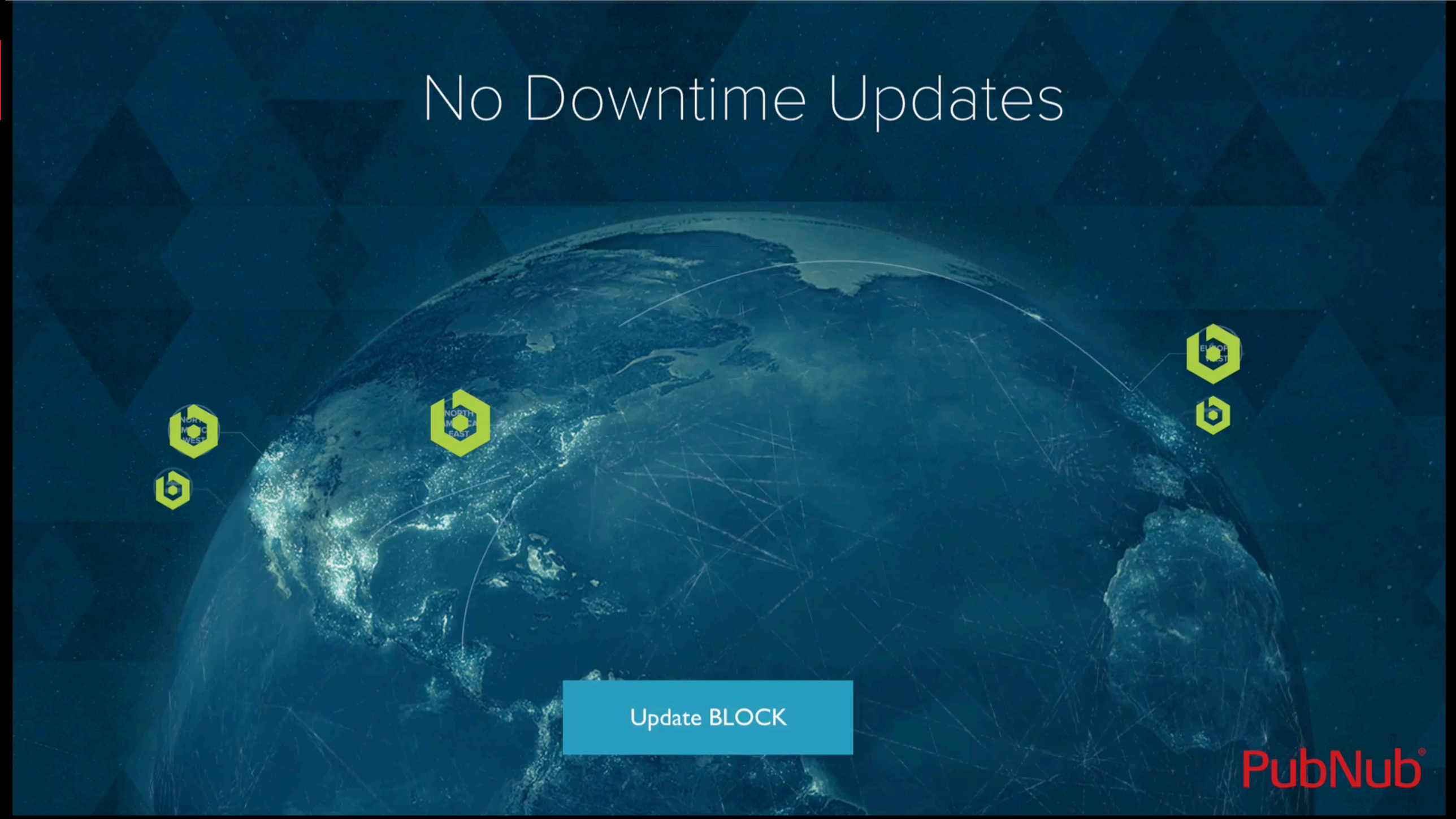
No Downtime Updates

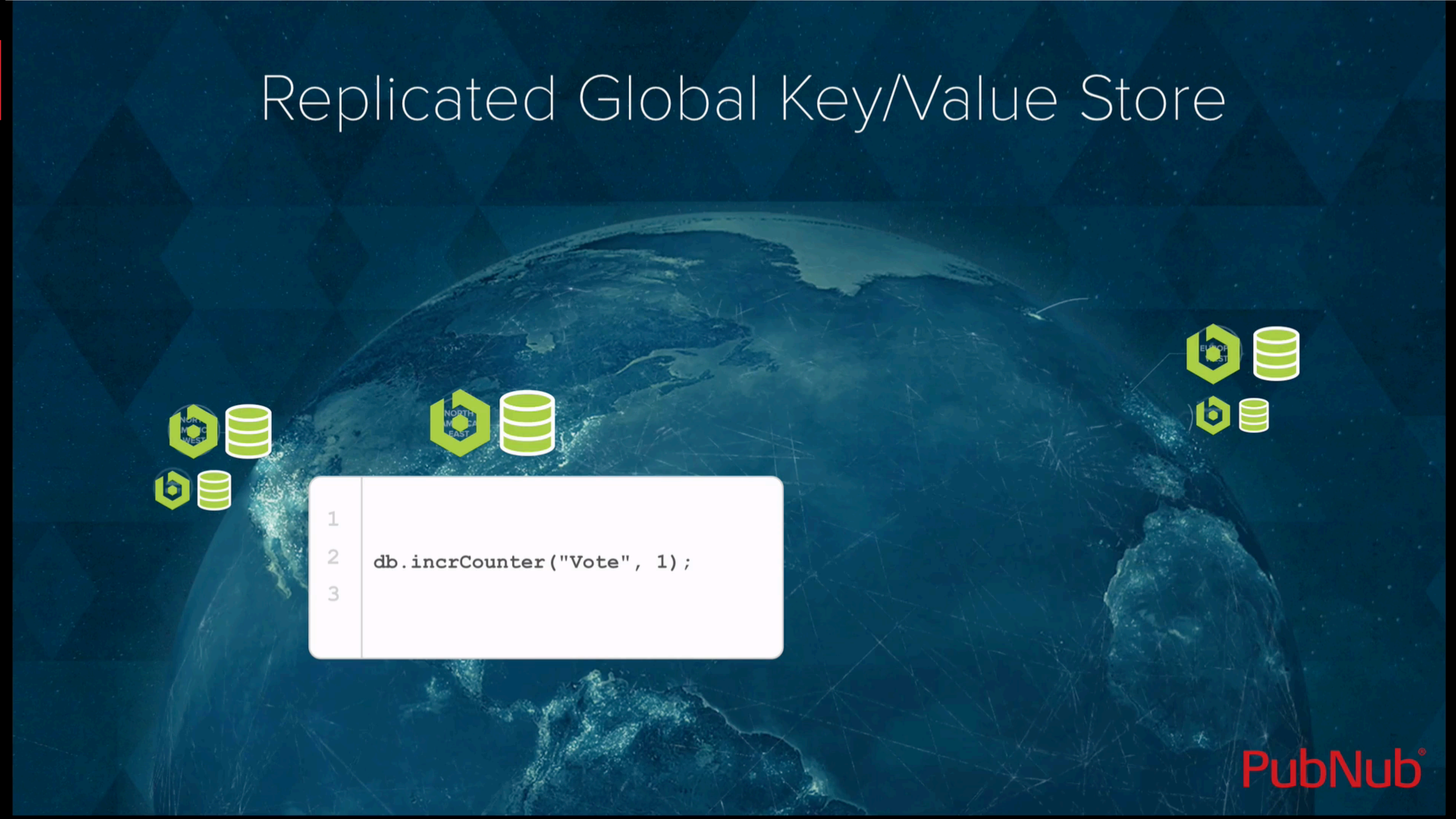


PubNub®

Replicated Global Key/Value Store

PubNub®

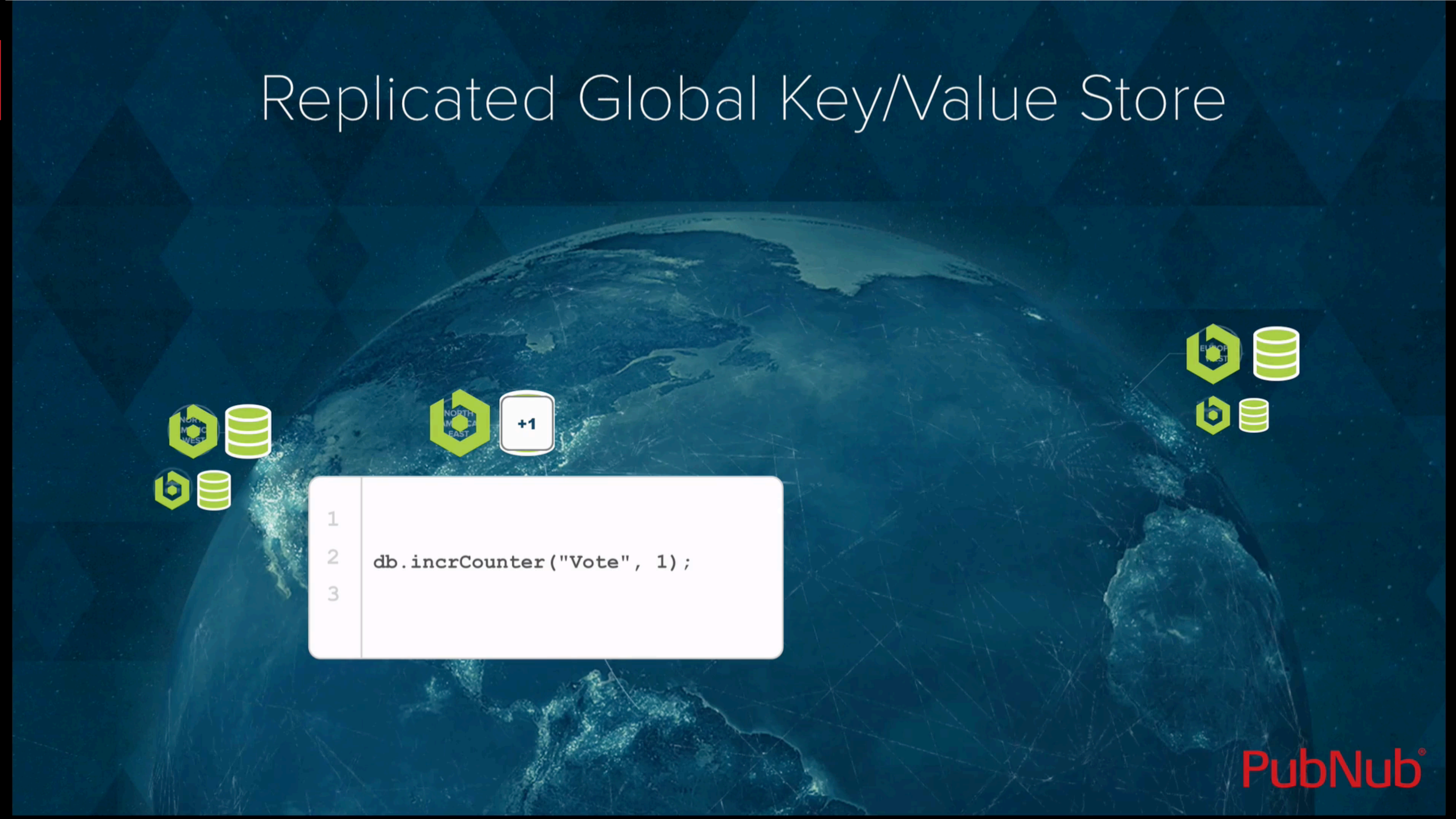
Replicated Global Key/Value Store



```
1
2  db.incrCounter("Vote", 1);
3
```

PubNub

Replicated Global Key/Value Store



PubNub®

PubNub

Demo of PubNub Functions

PubNub

It’s Been a Year...What did we Learn?

Things happen fast

2,000 TPS only 2 weeks after launch.

Change is hard

Design patterns for getting the most from Functions still not generally understood.

It isn’t a Choice

Web-scale, real-time apps must move in this direction to serve business needs.

Comprehension is Everything

The signal-to-noise ratio is huge in Serverless, app developers don’t have a clear path forward.

PubNub

Example Use Cases with PubNub Functions...

New customers are leveraging the PubNub BLOCKS Catalog to get started

Customers with live apps are often enriching functionality over time:

- Building @mention for chat
- Filtering repeating IoT msgs
- Counting votes/sentiment
- Dropping out-of-range lat/long
- Handling callbacks from SaaS vendors
- Exposing to their customers for customization of their own products
- Consuming large amounts of raw data and only publishing relevant data points
- Publish throttling for spammy users/devices
- Device provisioning and permission granting
- Transforming messages to support older product versions
- Detect obvious anomalies and highlight, while also sending data to AI/ML systems

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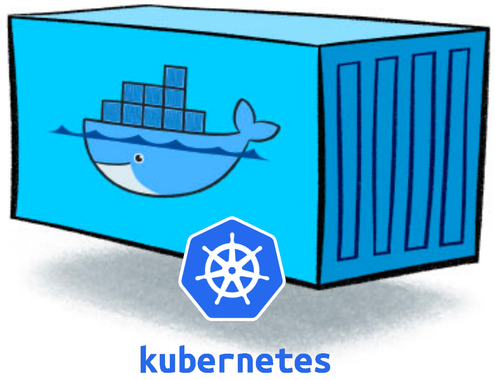
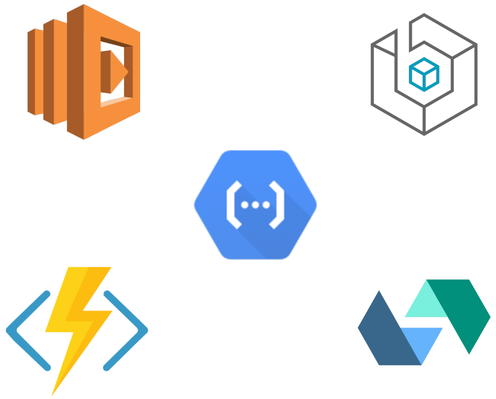
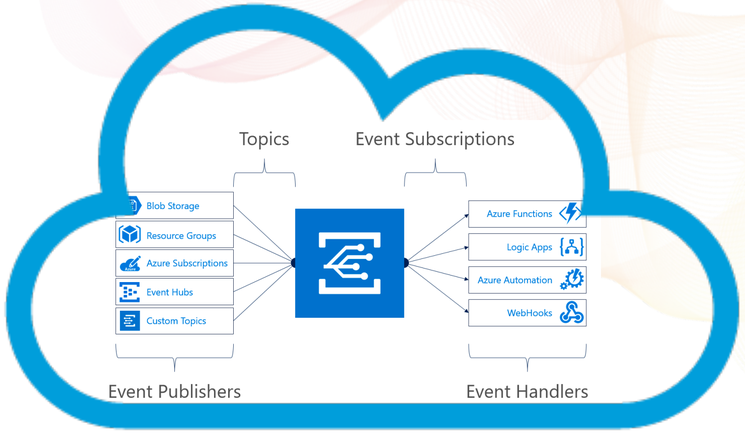
Microservices, Containers, FaaS, and Programmable Infrastructure



Microservices
Containers
Orchestration



Functions-as-a-Service



Event-Driven, Programmable Infrastructure

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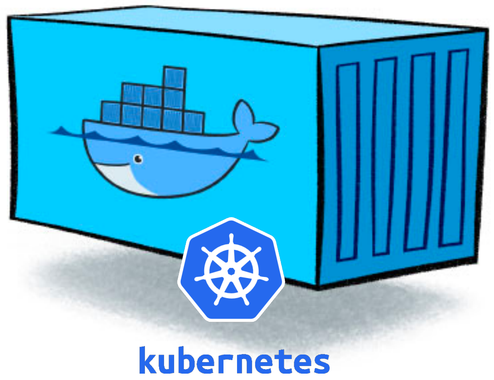
State of Containers, Microservices, Orchestration, Container Registries



Microservices
Containers
Orchestration

- Containers becoming a standard handoff point to Ops
- Strong adoption large enterprises, SaaS and Infrastructure
- Today's focus is on Orchestration (Kubernetes, etc), Container Registries
- Still mostly "coarse grain" usage patterns (monolithic moving into containers), vs loosely-coupled designs

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Functions-as-a-Service

FaaS

AWS Lambda | **Azure Functions** | **Google Functions** | **PubNub Functions** | **IBM OpenWhisk**

and others…

- FaaS offerings are *not all the same*, but they do all deliver a similar baseline of value:
  - ✓ Autoscale as needed
  - ✓ Support for common programming language(s)
  - ✓ More efficient cost model
  - ✓ No need to operationalize code or manage services
  - ✓ Extending existing application functionality easily

- Getting lots of attention, with frameworks and companies like Serverless Inc adding abstraction layer above Functions offerings.

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Generalized, Specialized, Hybrid FaaS

AWS Lambda

Generalized FaaS

Built to handle +/- any size of function
Optimized for cost ($/GB Second) vs speed/latency
Support for many programming languages
Stateless

PubNub Functions

Specialized FaaS

Built for small, lightweight functions
Optimized for speed to minimize latency in realtime apps
Replicated to all edge points to remove fan-in issues
Tightly coupled to local K/V store to keep state

IBM OpenWhisk

Hybrid FaaS

Built on Docker for easy hosting locally (on-premise)
Focused on the G2000 demand for hybrid cloud
Closest to std container/orchestration (Docker/Kubernetes)

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How is mostly FaaS Used Today?

Big Monolithic App

Cloud Instances

Cloud Instances

Cloud Instances

A Bunch of Server instances

Traditional 3-Tiered App

Occasional server-side triggered helper functions

REST Calls

End users / IoT devices

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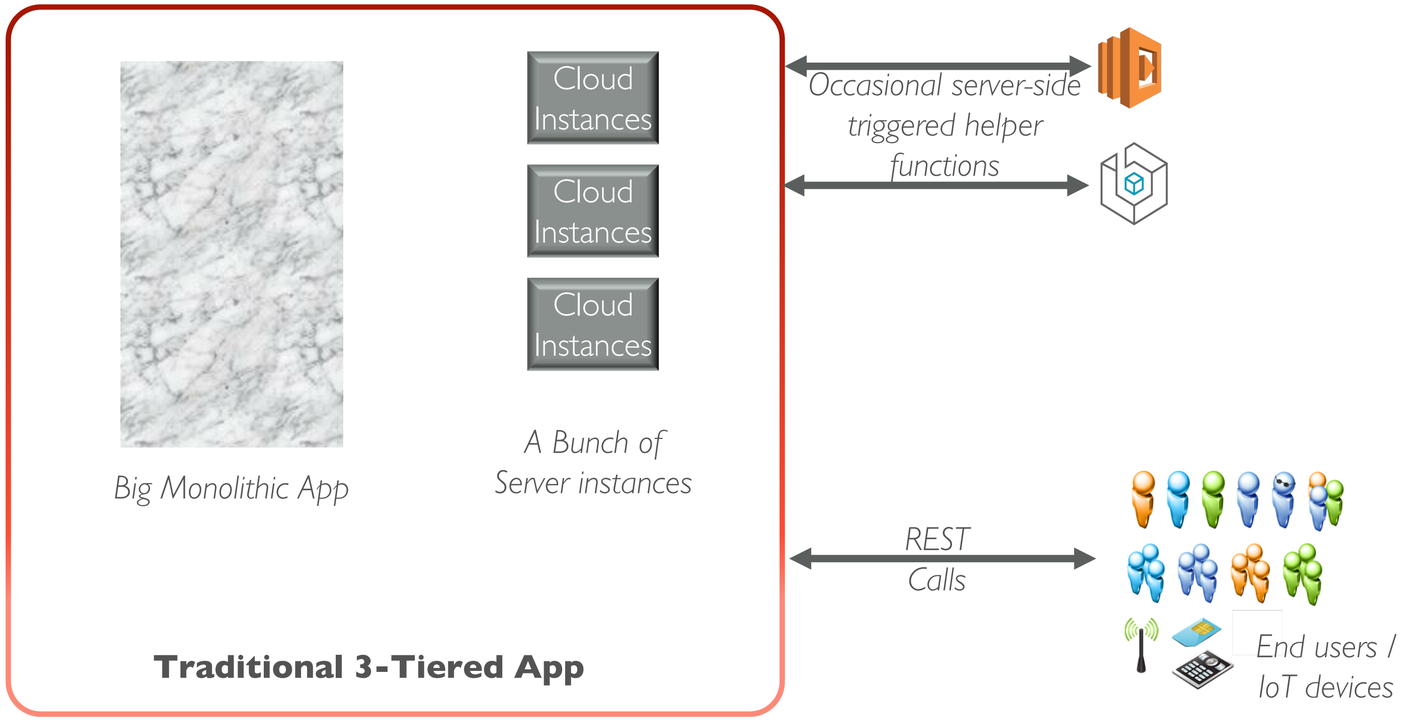
Most of FaaS Value not yet being used



Most apps are still monolithic

FaaS helping in small, tactical areas

Still managing server instances

End device data flow hasn't changed

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The Missing Link: Event-Driven Architecture

Event Architectures aren't new

- UI Frameworks are generally event-driven
- SOA is event-driven
- Recommended microservices design patterns are event driven

However, Cloud-developed Apps are still monolithic

- Reliance on IaaS services which are black boxes
- Generation of app developers that have only learned 3-tiered designs – LAMP, MEAN, Rails, .NET, etc

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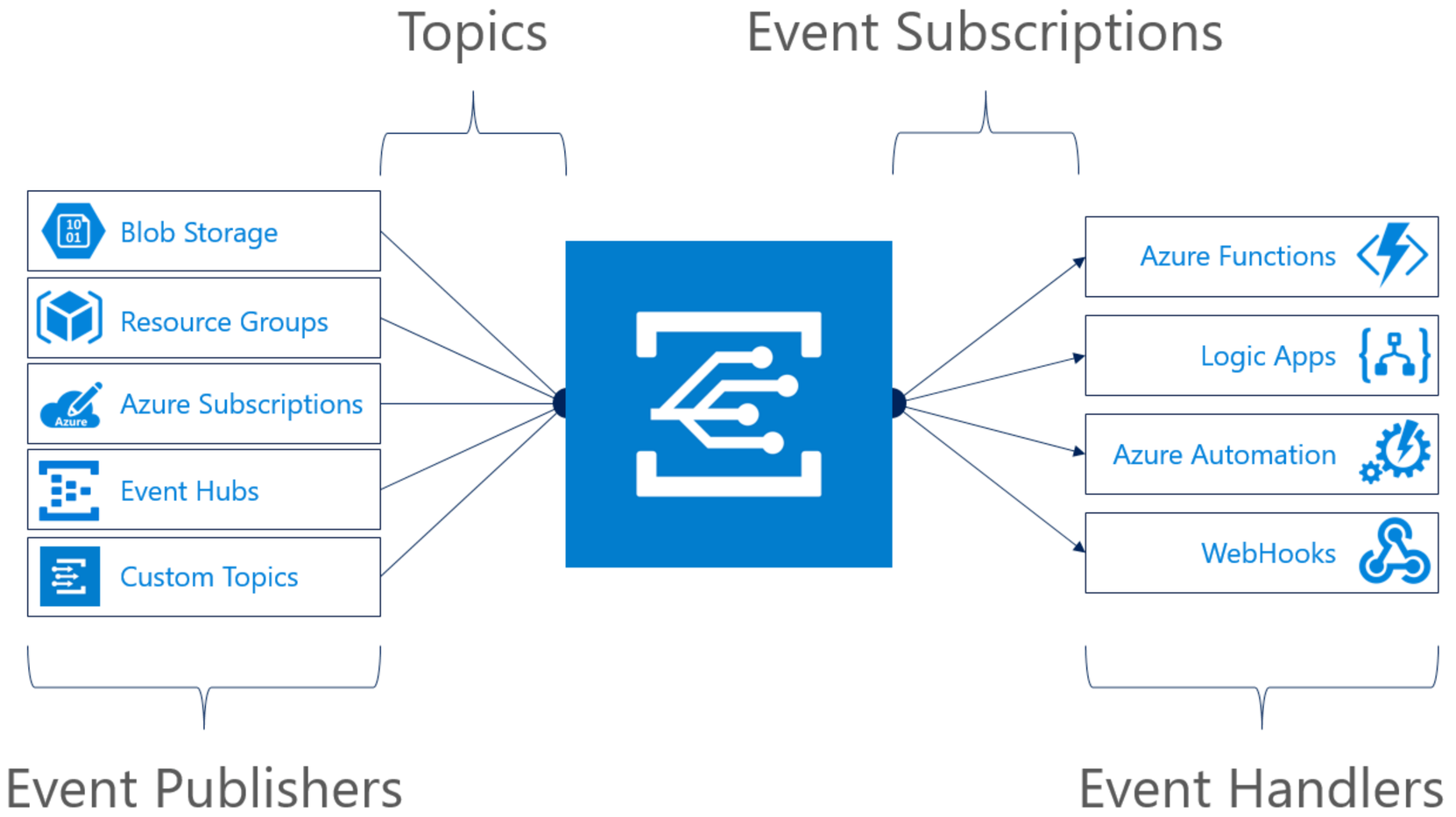
Wiring Events into IaaS



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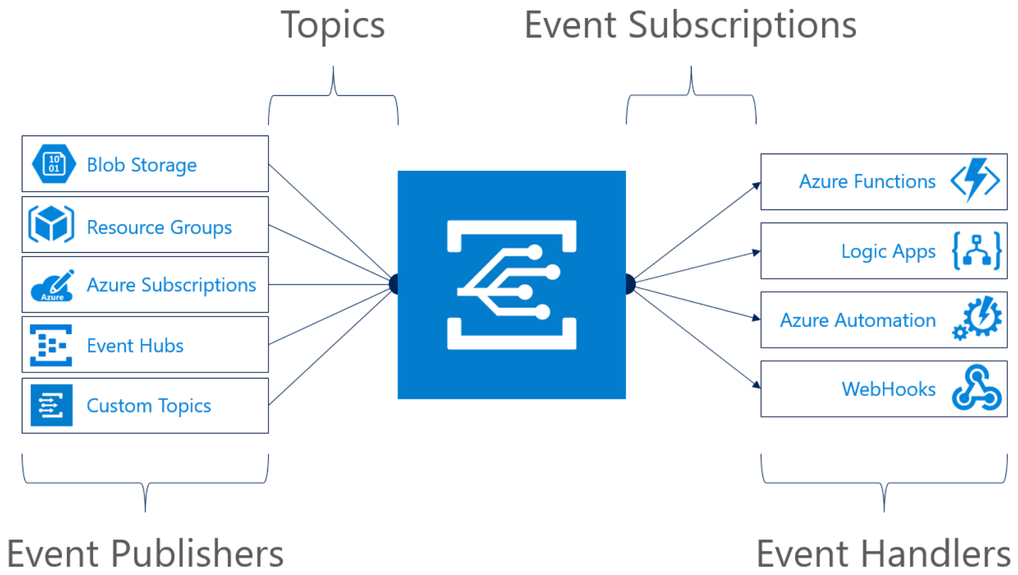
Wiring Events into IaaS: Terminology



Events: what happened
Event Publishers: where it took place
Topics: where publishers send events
Event Subscriptions: how you receive events
Event Handlers: the app or service reacting to the event

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Wiring Events into IaaS

When IaaS services become Event-driven,
cloud-based application architectures will completely change

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Use Case – Mobile Live Image Stream

Monolithic Approach

Image
Upload /
Distribution Server

- Authentication
- Visual processing/Content Filtering
- Watermarking
- Write metadata to DB

- Authentication
- Poll DB to check for new images
- Determine which users subscribed to which image tags
- Queue the new images for each user (per user queue?)
- Determine resize and/or other user preference needs for image

Poll to Check for new Images

Ops Headaches

- Load balancing
- Server instance capacity
- Monitoring & Recovery
- DB maintenance

User Experience

- Non realtime
- Unpredictable latency

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Use Case – Mobile Live Image Stream

Event-Driven Approach

Direct upload to Azure Storage

EVENT FIRED

Azure Function

- Store image metadata

EVENT FIRED

PubNub Function

- Publish new image notice to image tag channel (“kitty”)

PHONES NOTIFIED

PHONES REQUESTS IMAGE URL

Ops Benefits

- No server instances to manage
- Only pay as users scale
- Loosely coupled functionality makes new features easy to build
- Multiple dev teams can work together by subscribing to same events
- Multiple cloud services can be used together

User Experience

- Instant notification & download of image
- New features added quickly as new image filters, etc are added to function

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Demo of Azure Event Grid + PubNub

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Discussion

Work to be Done in the Industry

- Tooling, esp. cross-cloud
- Debugging, instrumentation, common security models

Predictions

- Containers going away?
- Events across clouds comes sooner than expected…

Current Friction Points

- Price predictability (what's a GB Second?)
- Monitoring and error management

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Q/A