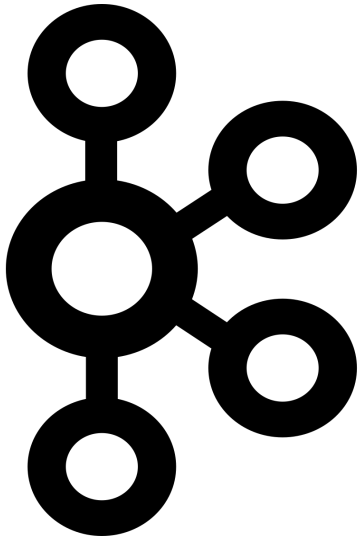


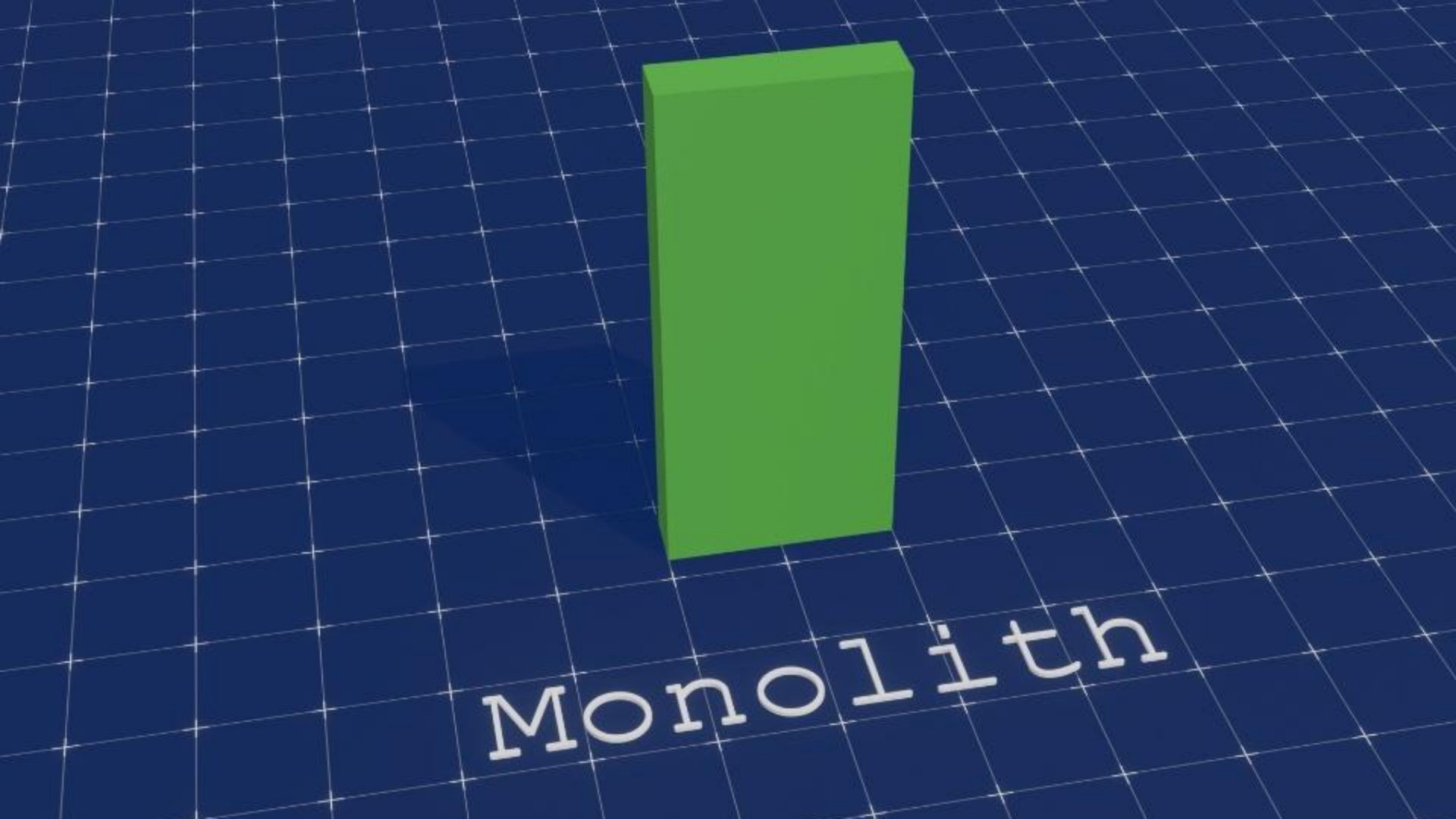
Apache Kafka

Introduction

An Evolving System will require change

Blocker:

The Monolith Arch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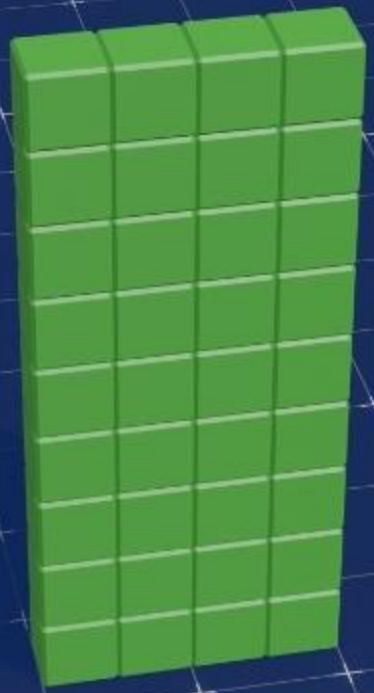
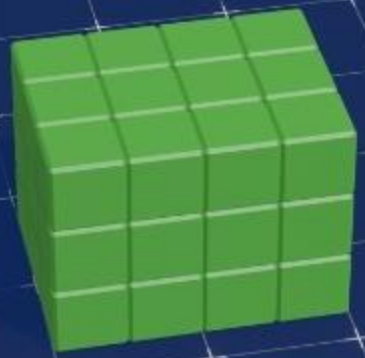


Modules

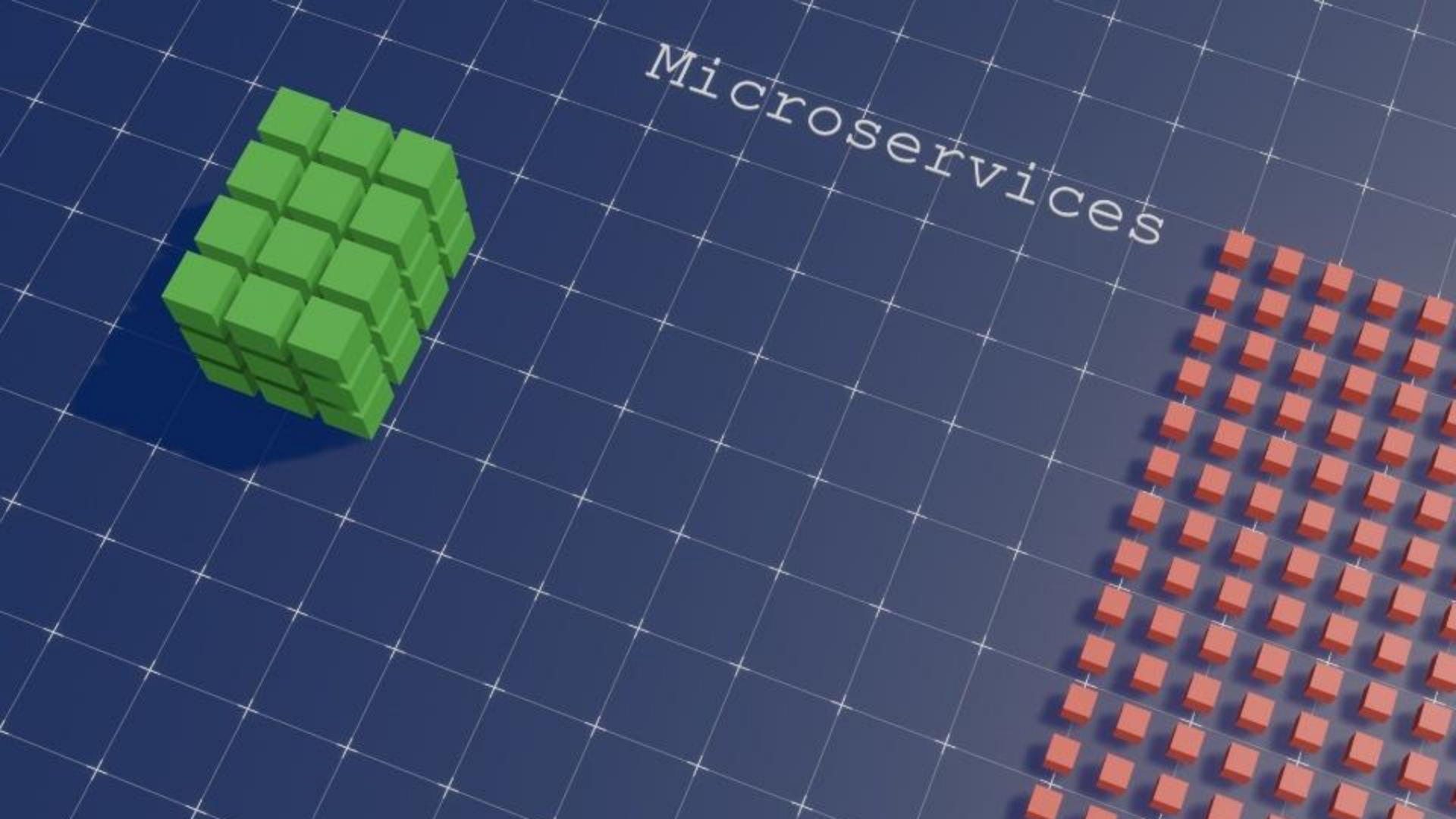
Monolith



Modules

Monolith

Solution:
The Distributed Systems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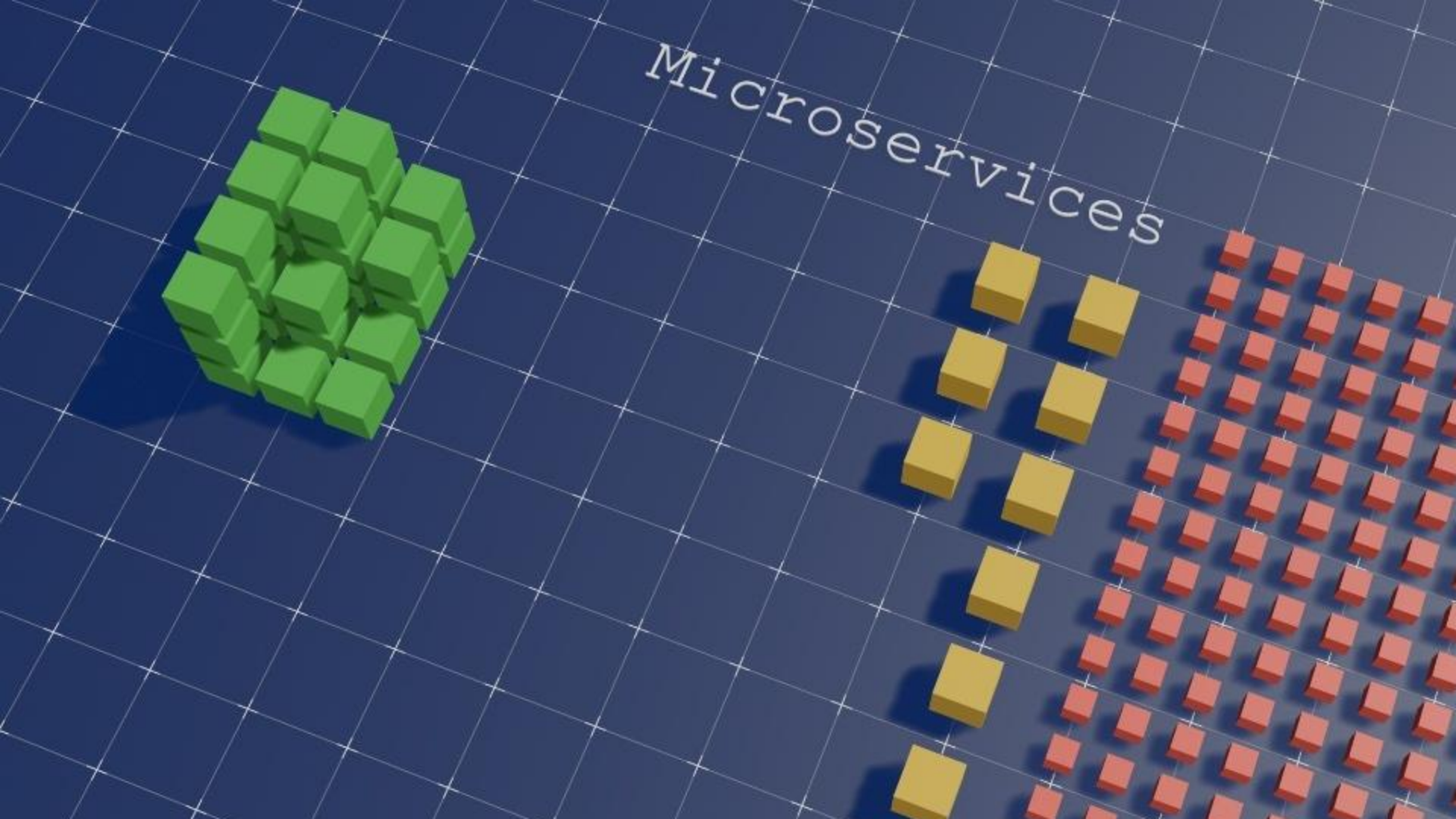
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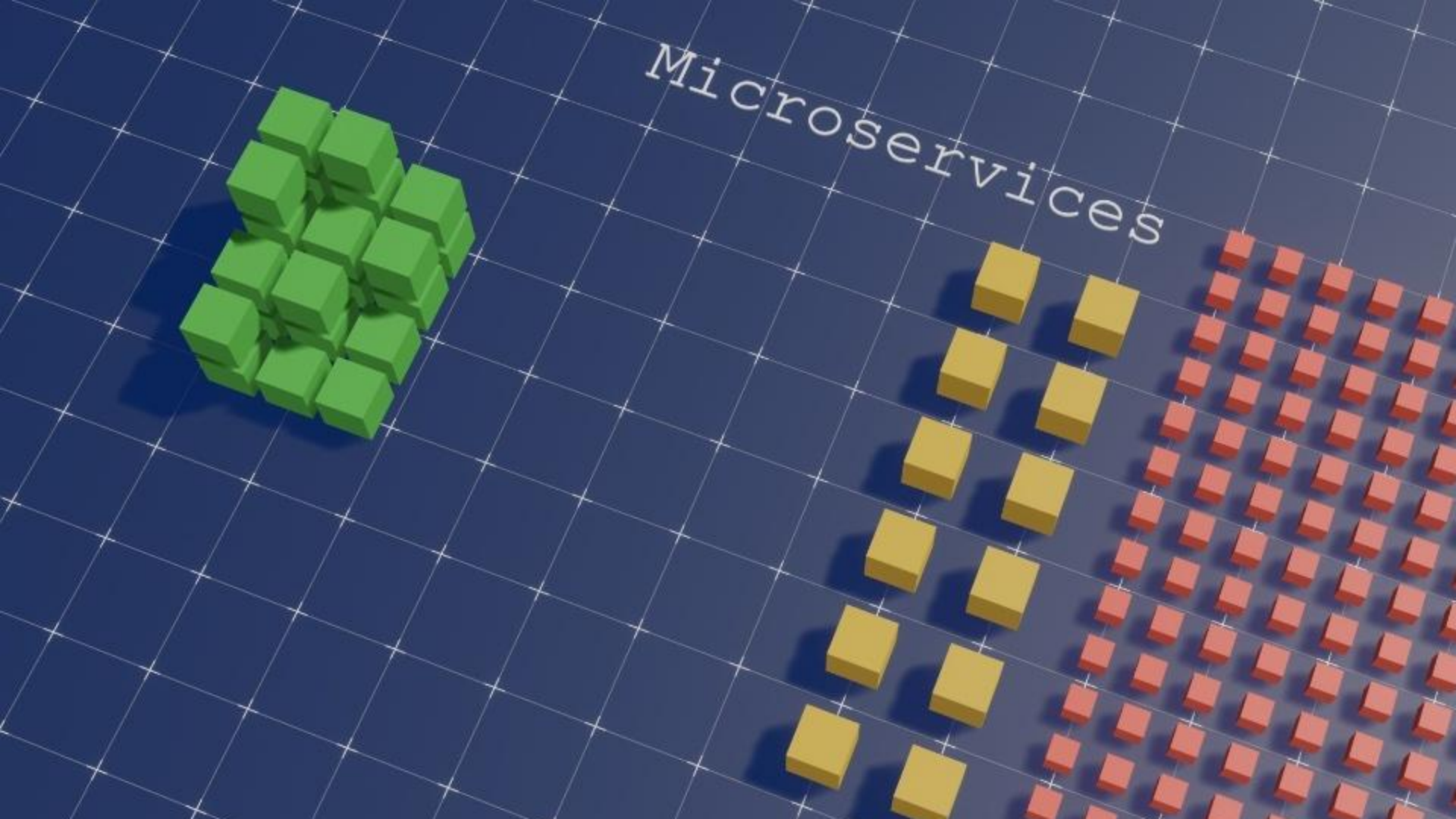
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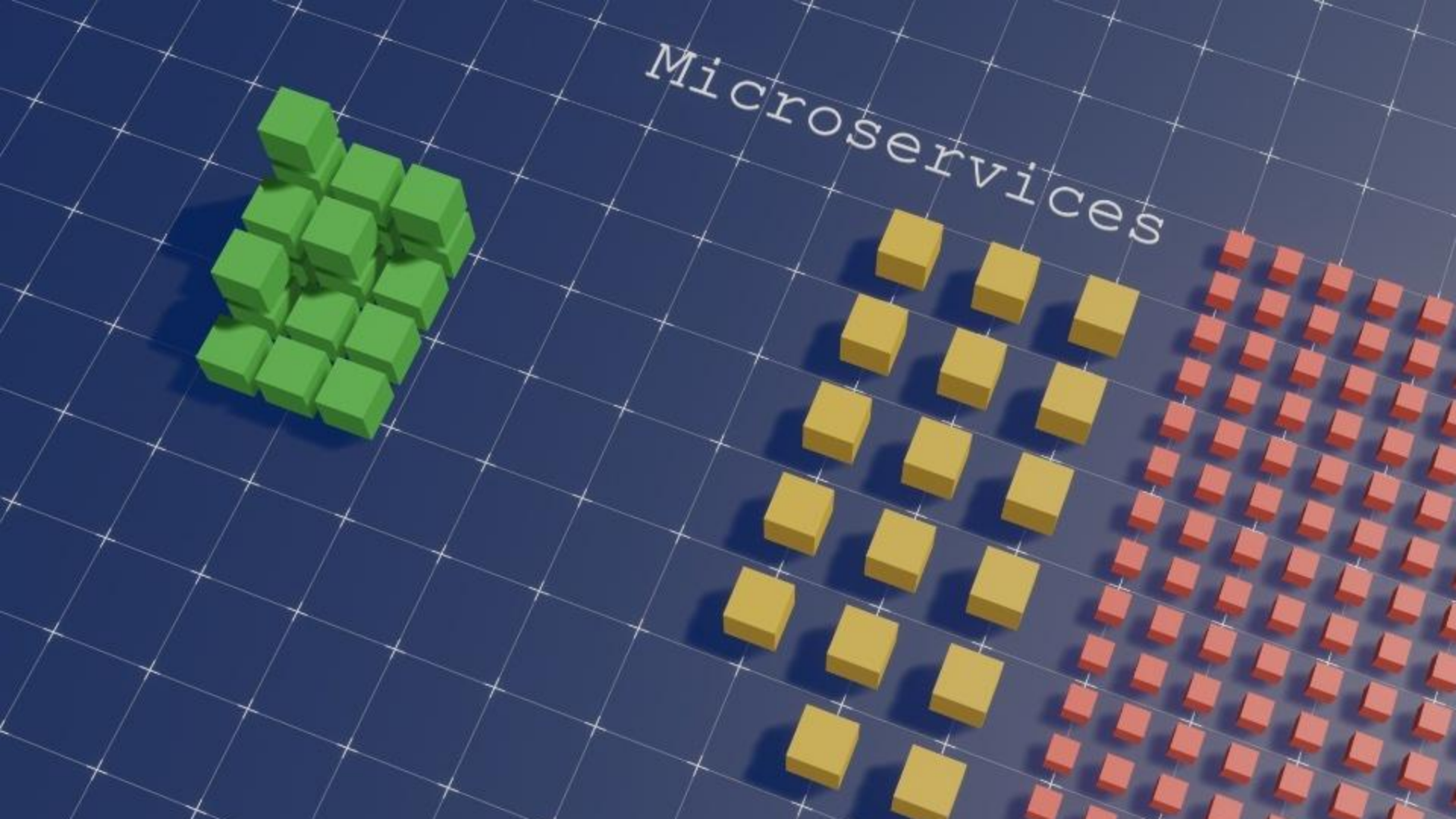
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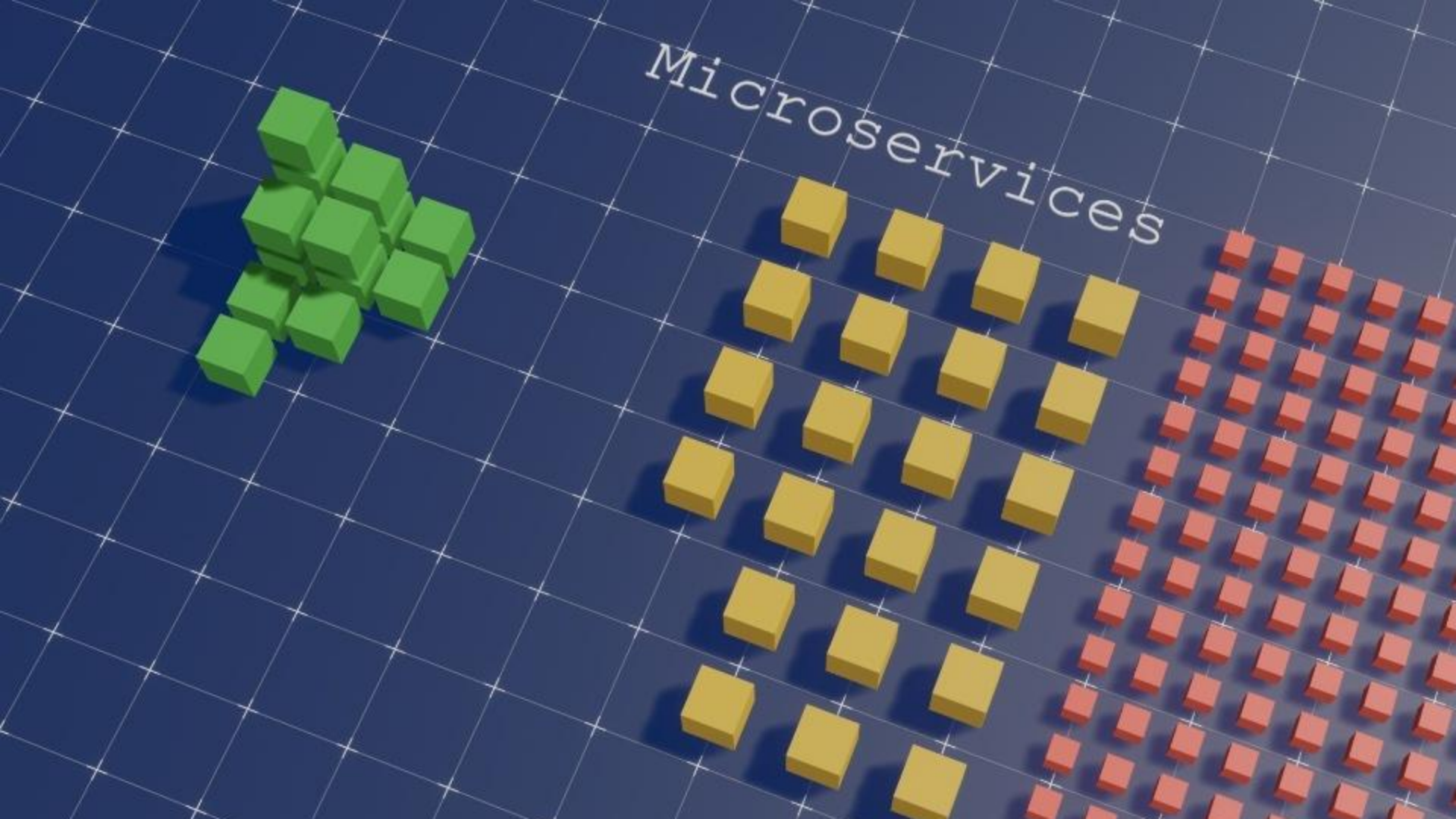
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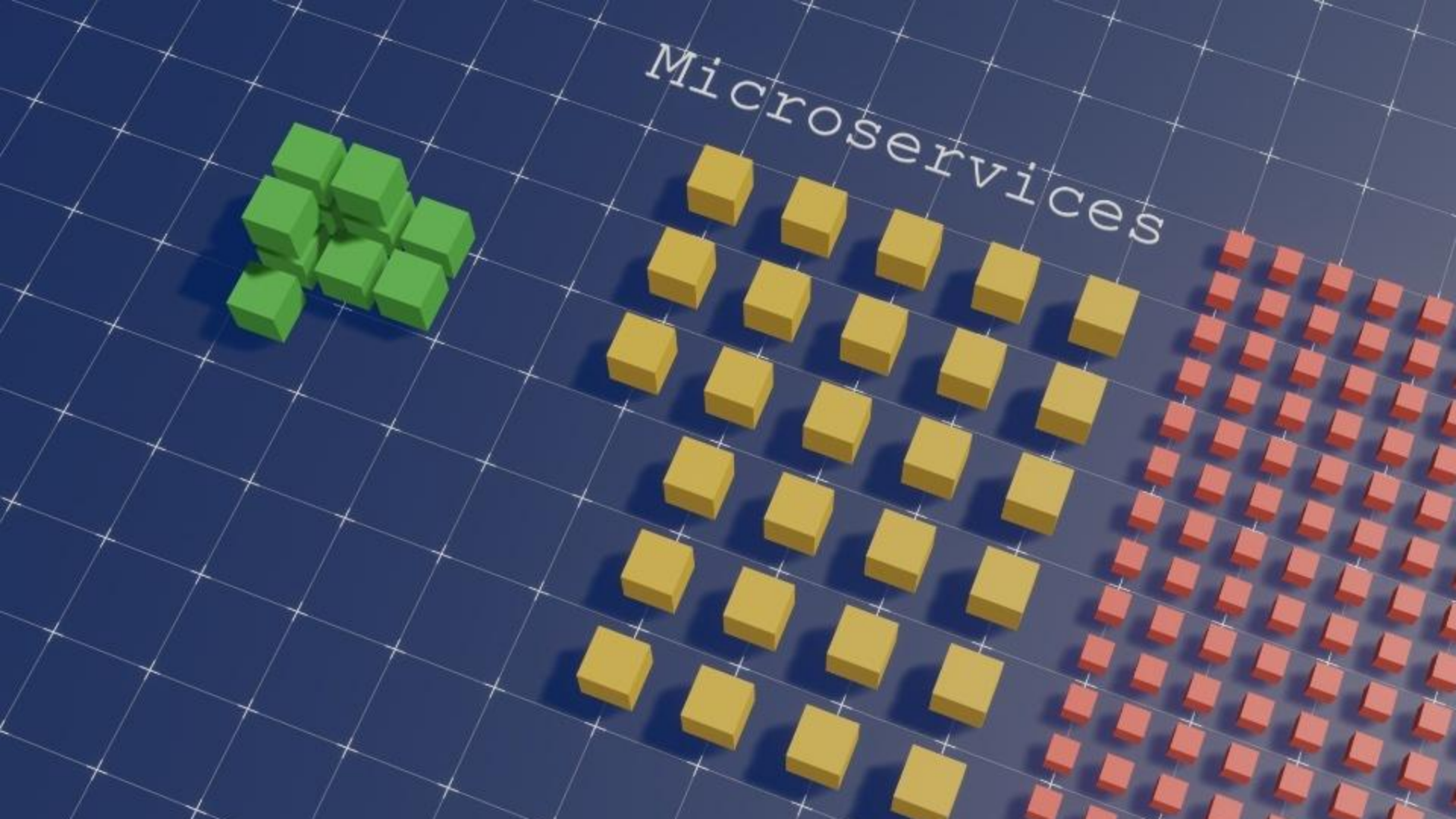
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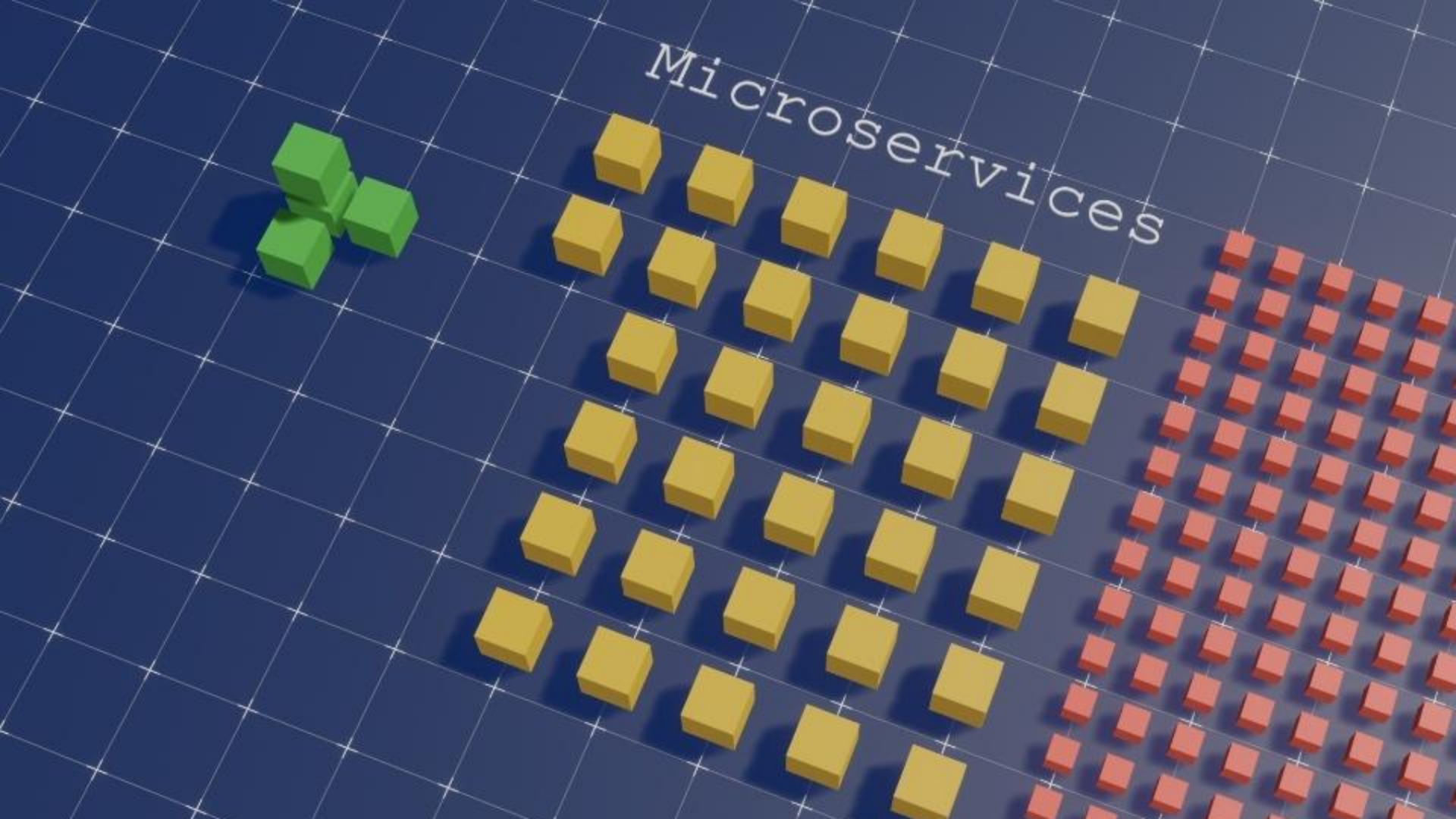
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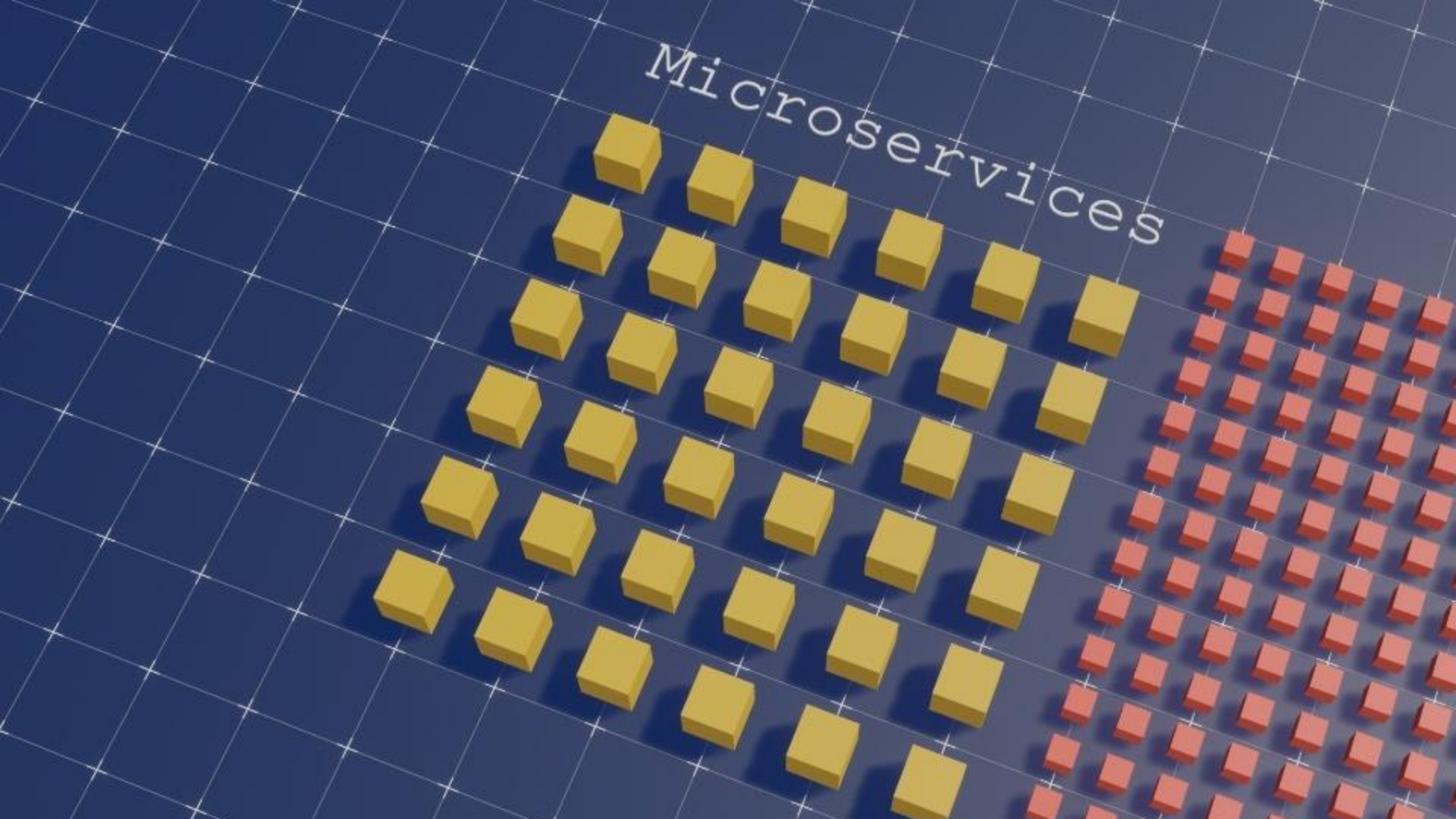
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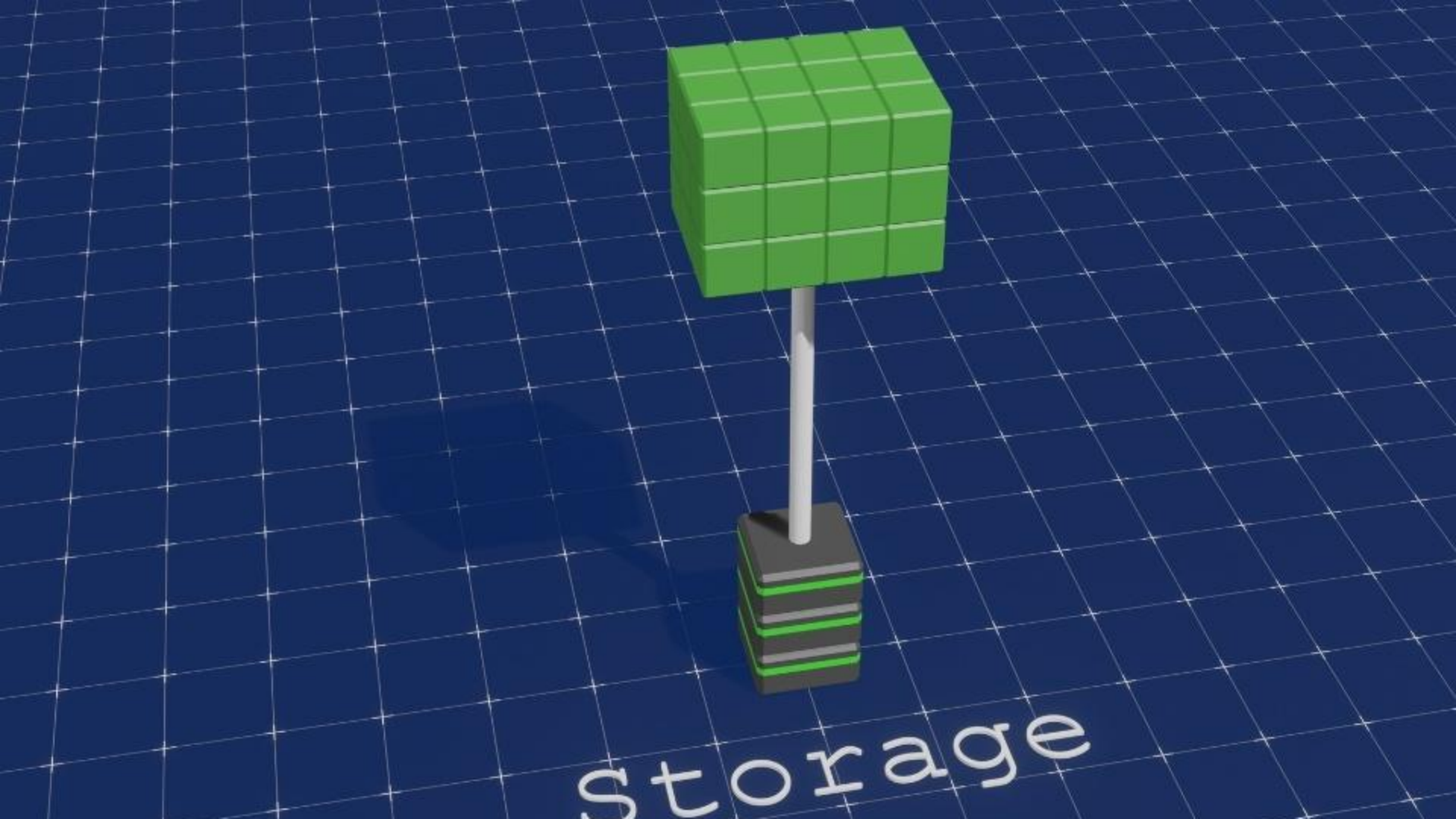
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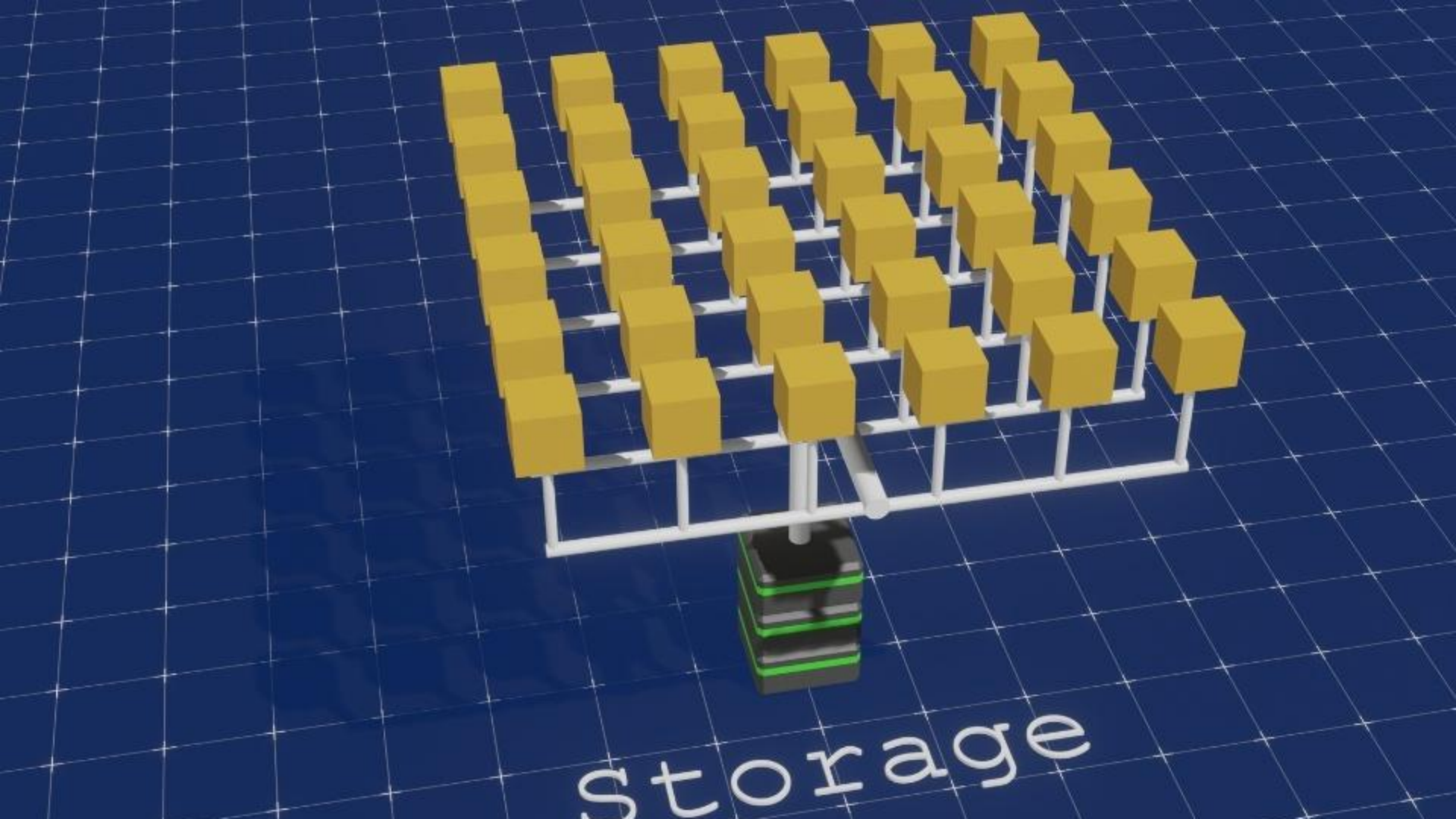
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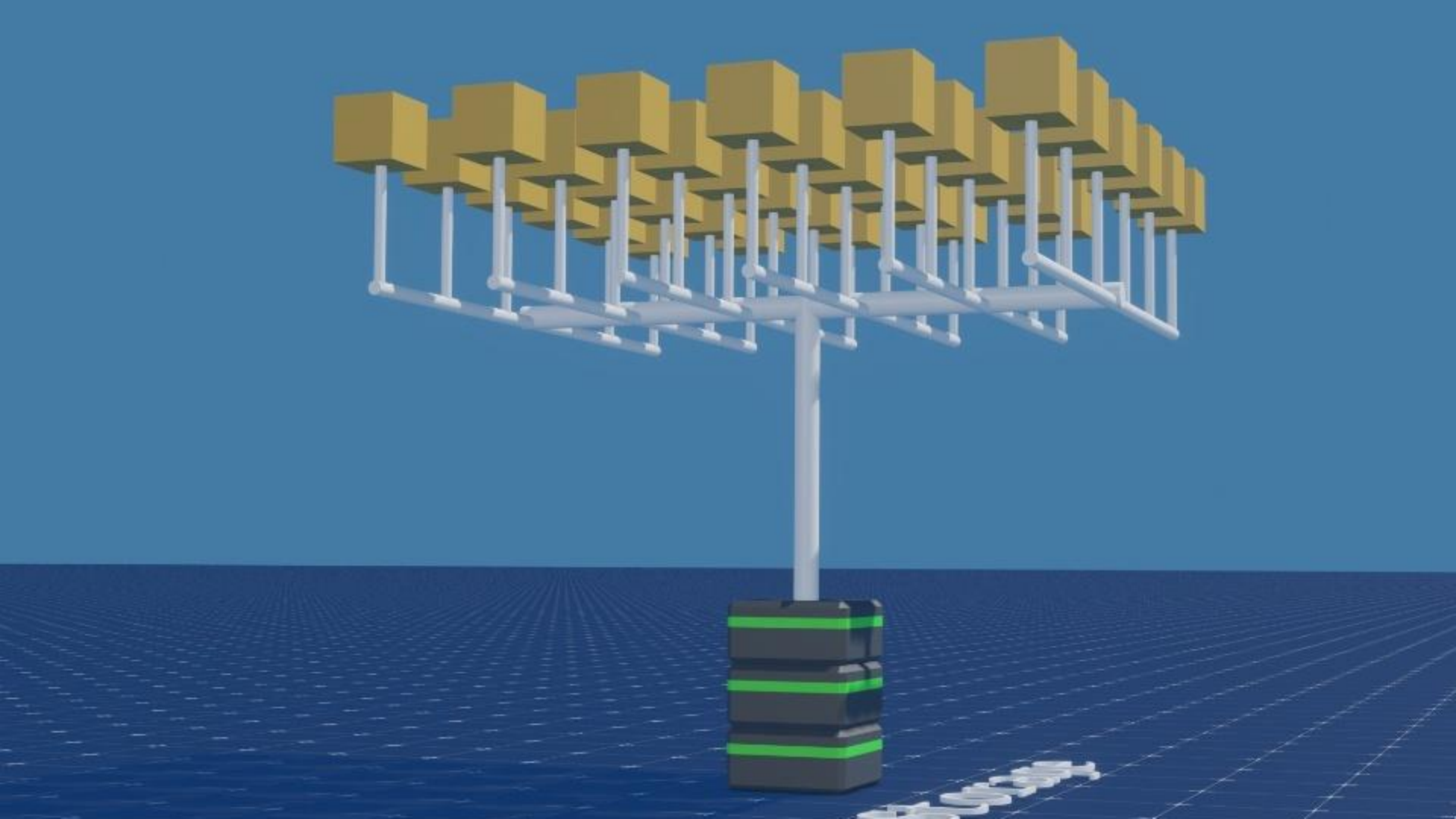
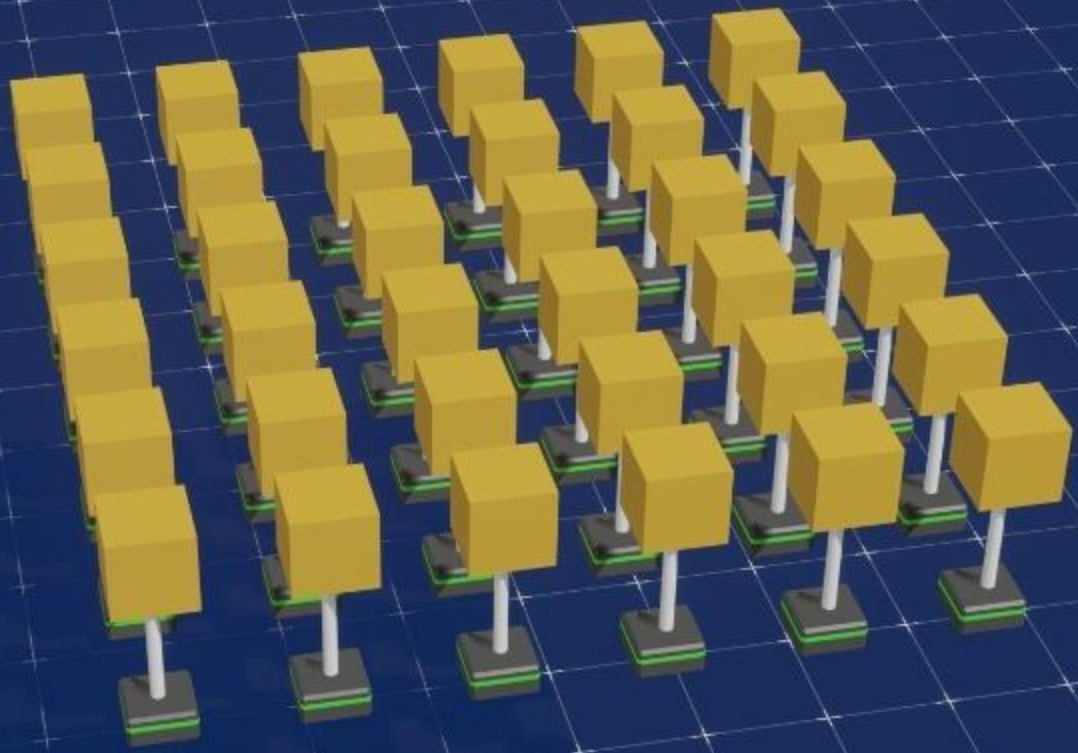
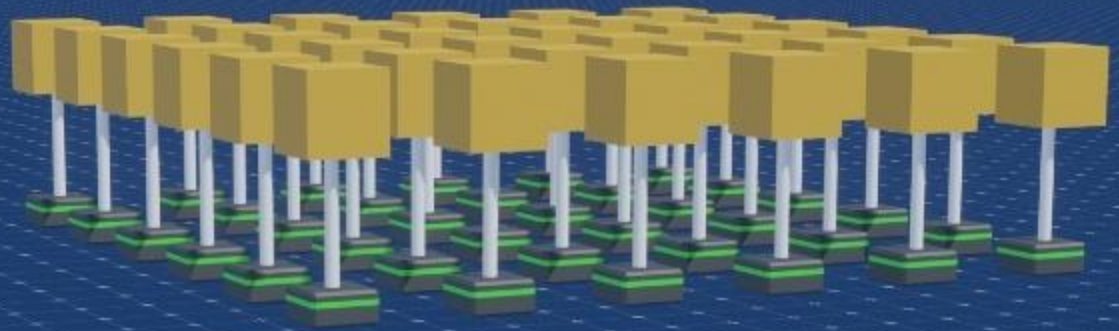
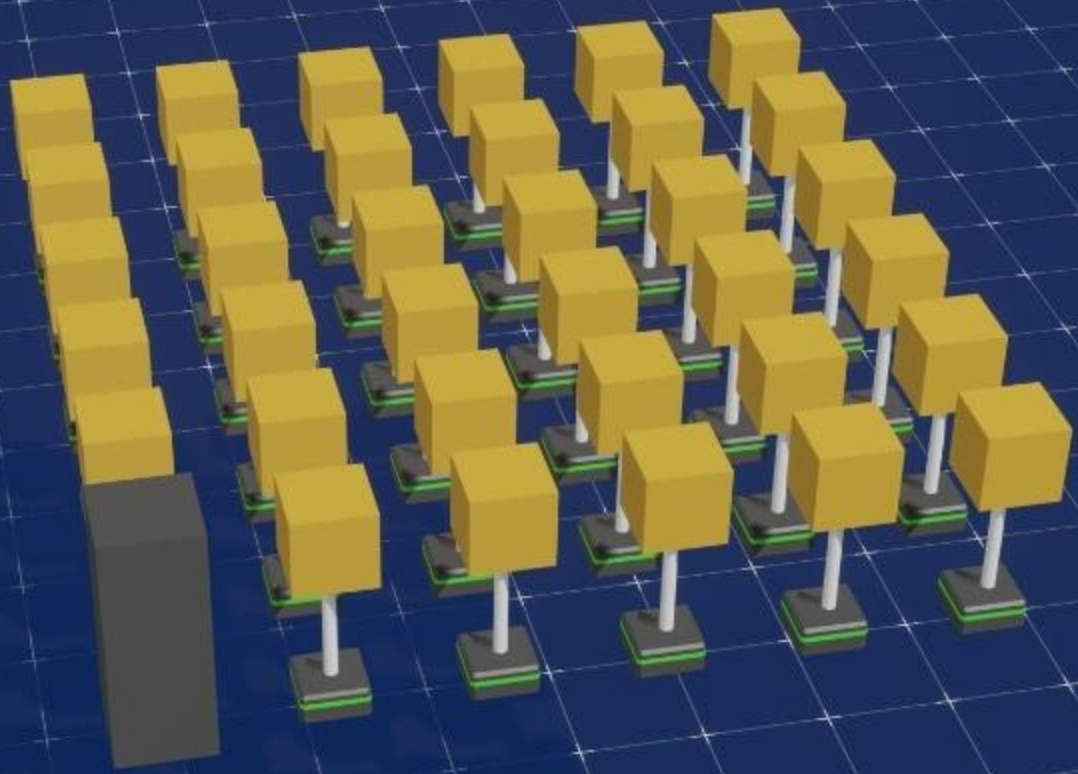




loosley coupled

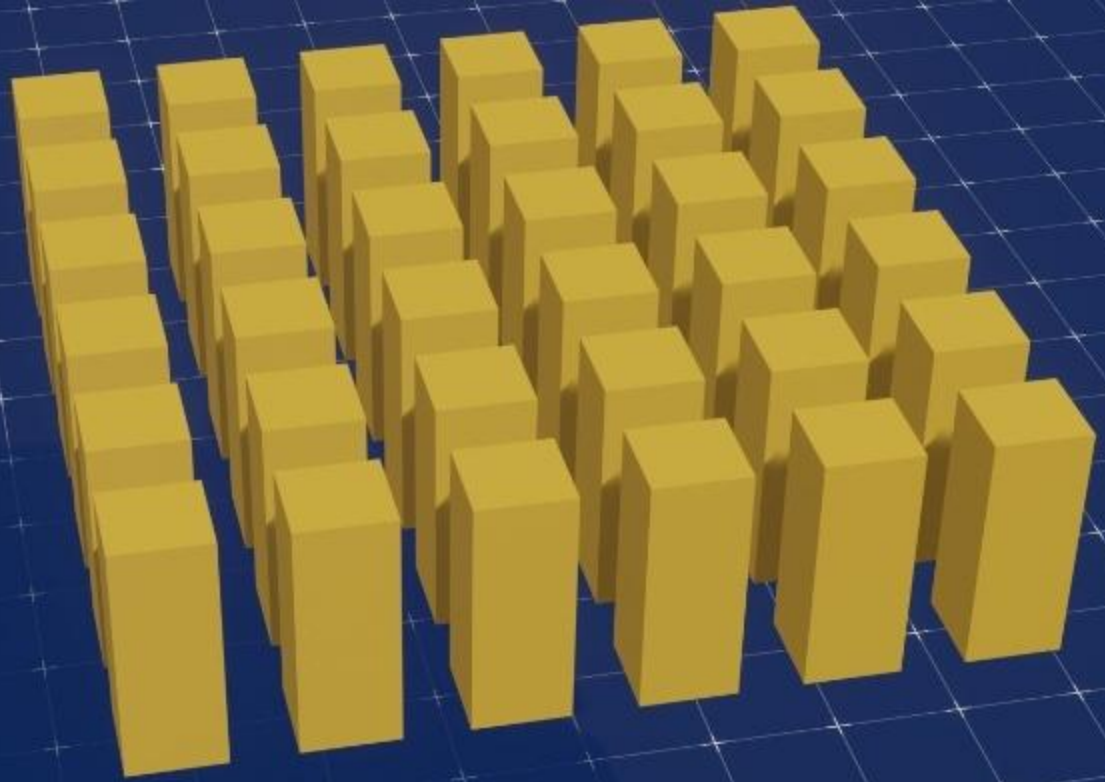


loosley coupled



loosley coupled

loosley coupled



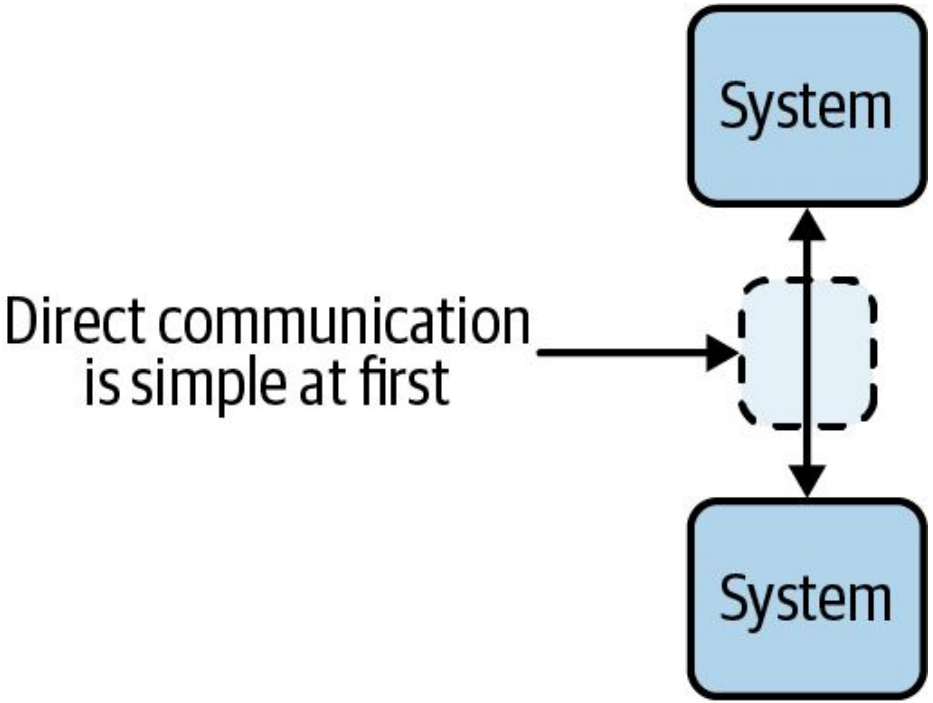
loosley coupled

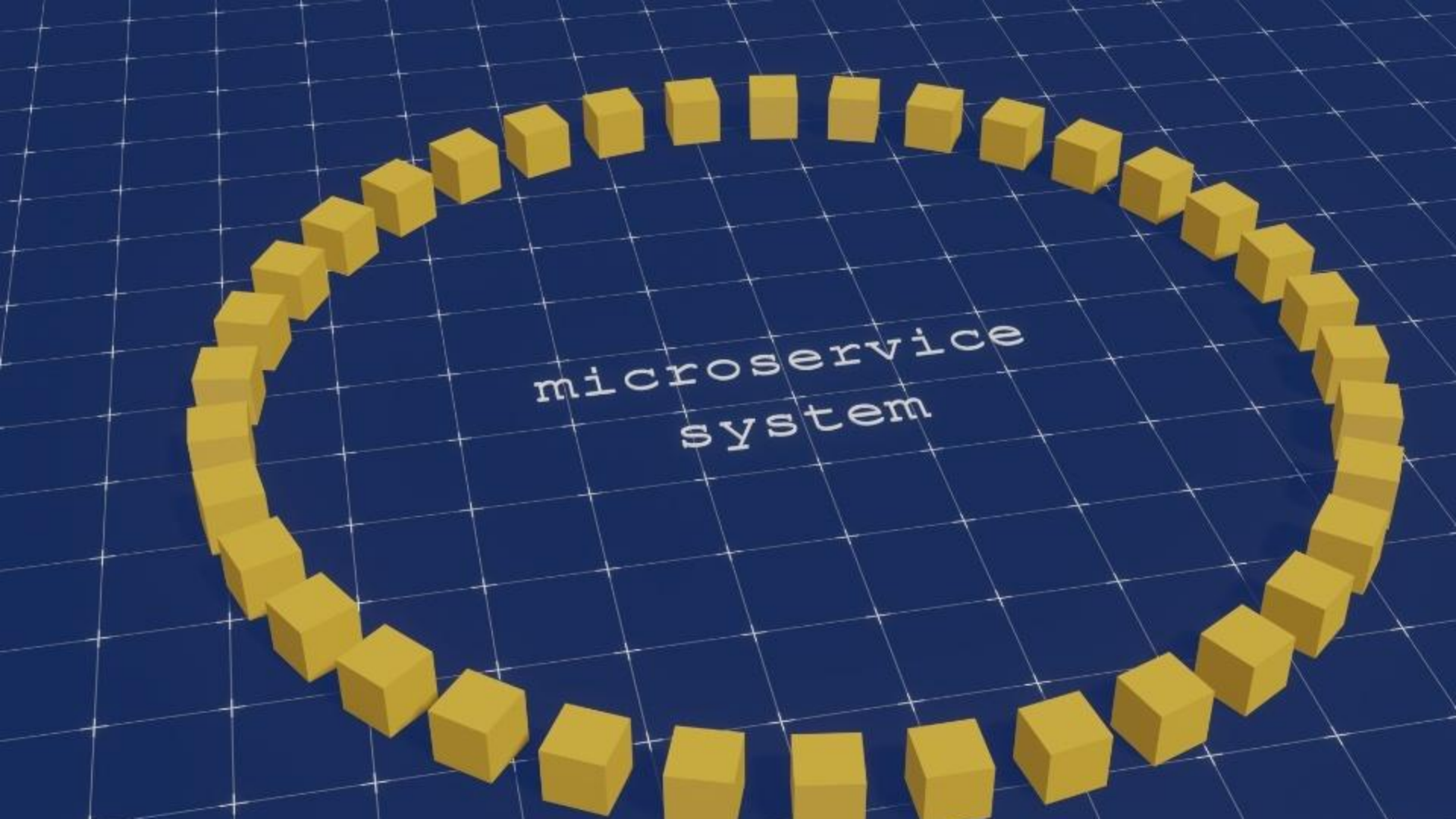
Traditional Communication Model

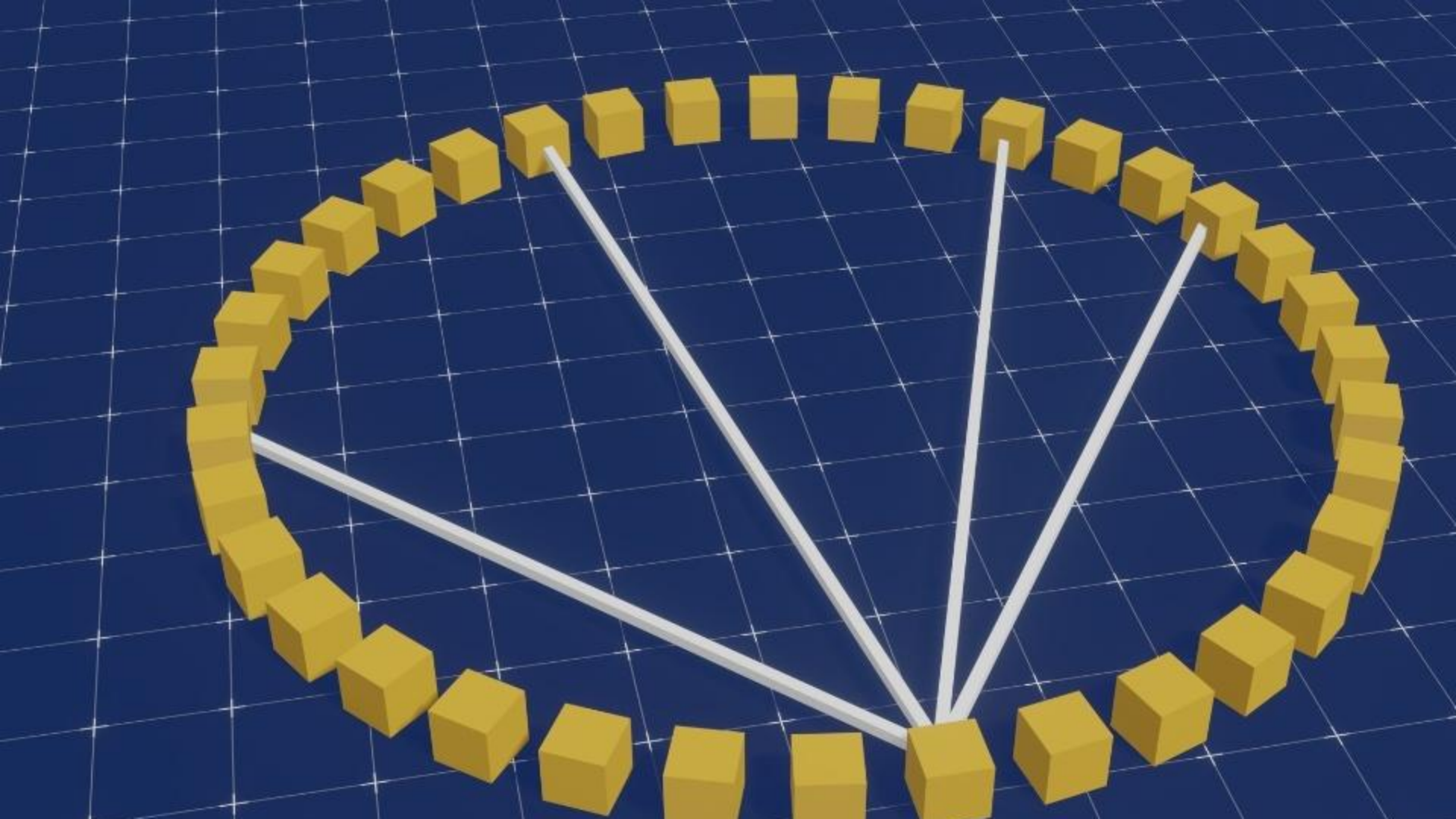
Client-Server Communication

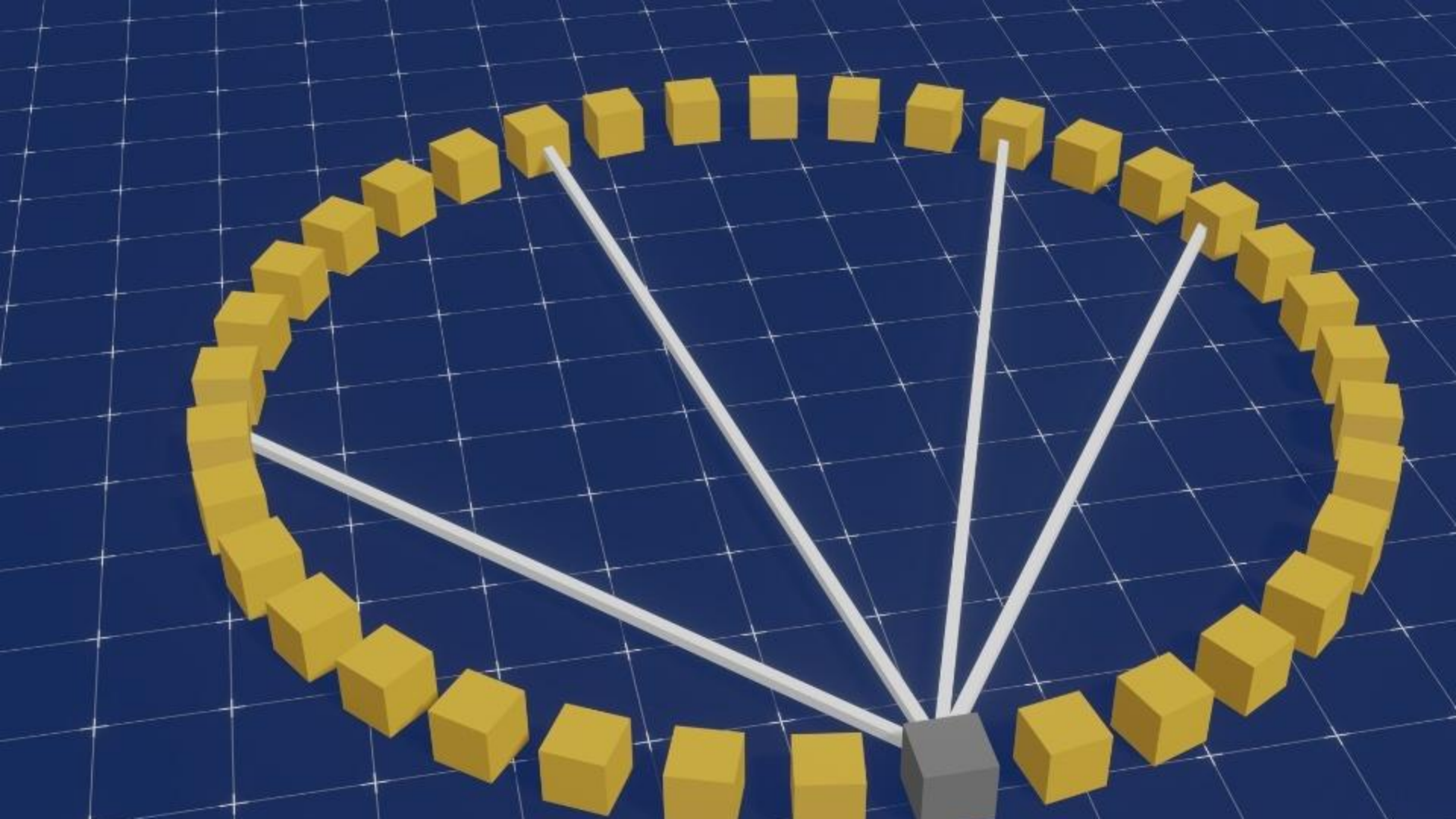
The Client-Server Communication Model

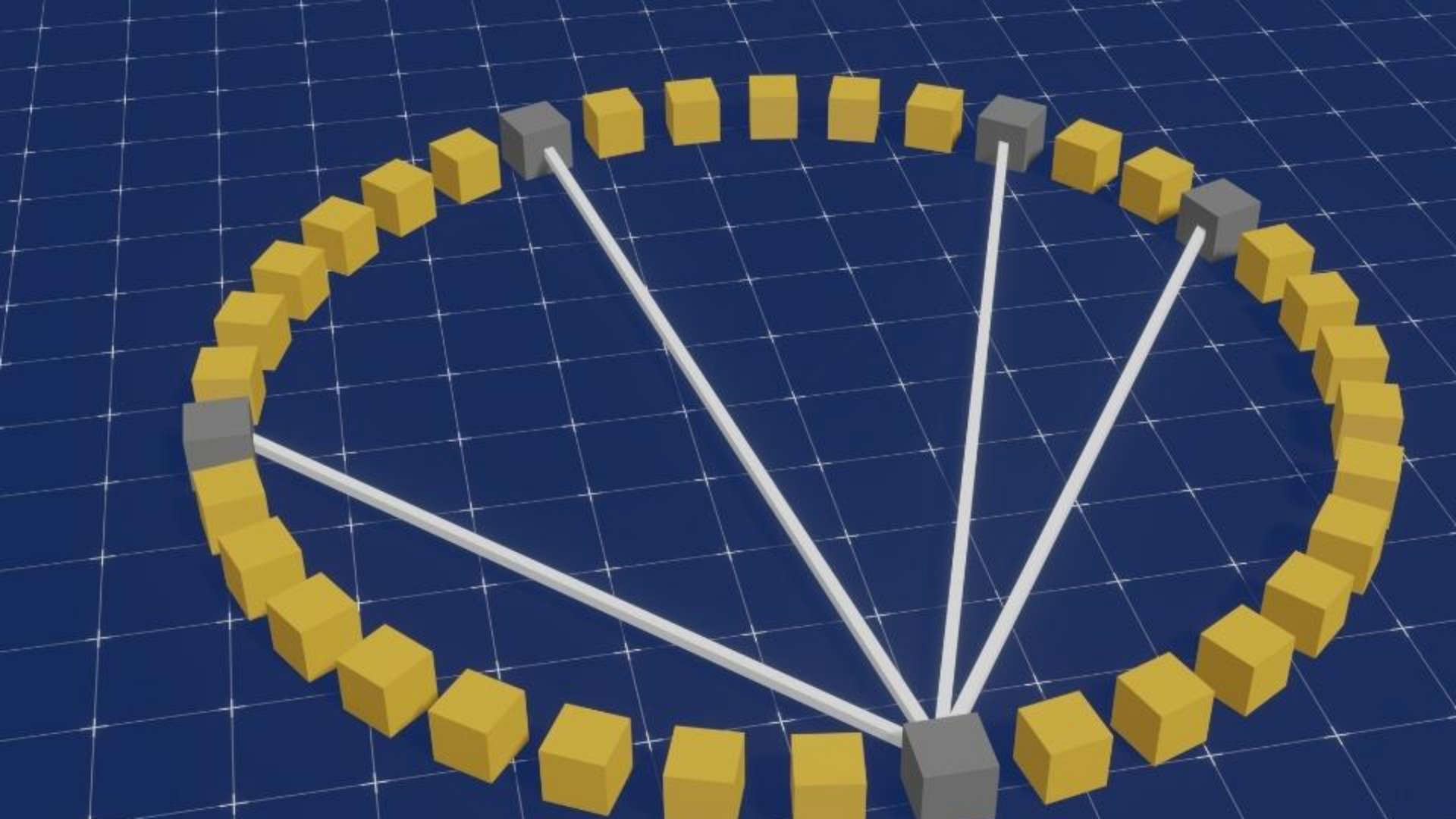
- Common in applications, microservices, and databases
- Simple and direct but becomes complex with scale



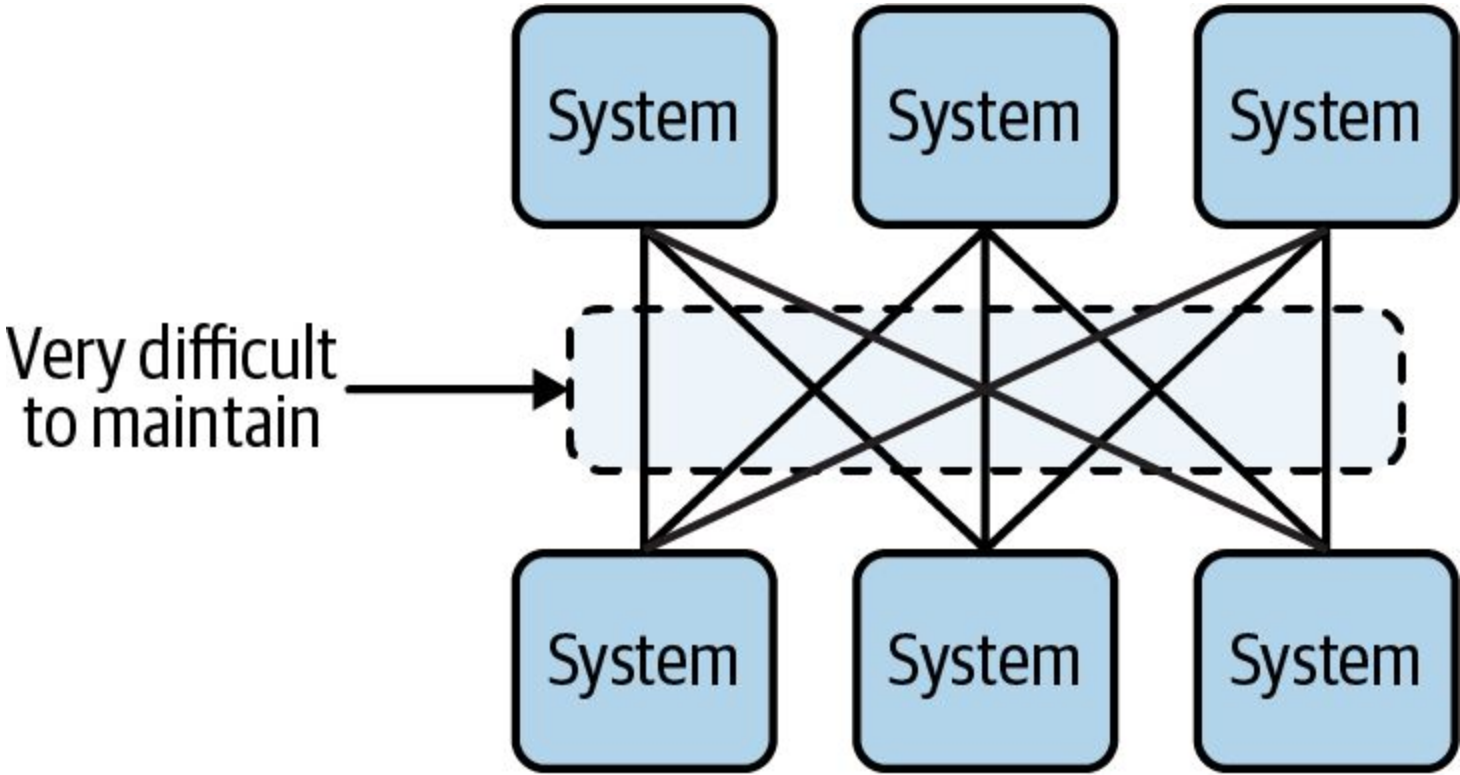

microservice
system







Challenges of scaling point-to-point communications



Drawbacks of Client-Server Model

- Tightly coupled systems, difficult maintenance and updates
- Synchronous pitfalls: No delivery guarantees if a system goes offline
- Communication inconsistencies: Different protocols and strategies
- Data flow issues: Overwhelming receiving systems, lack of replayability

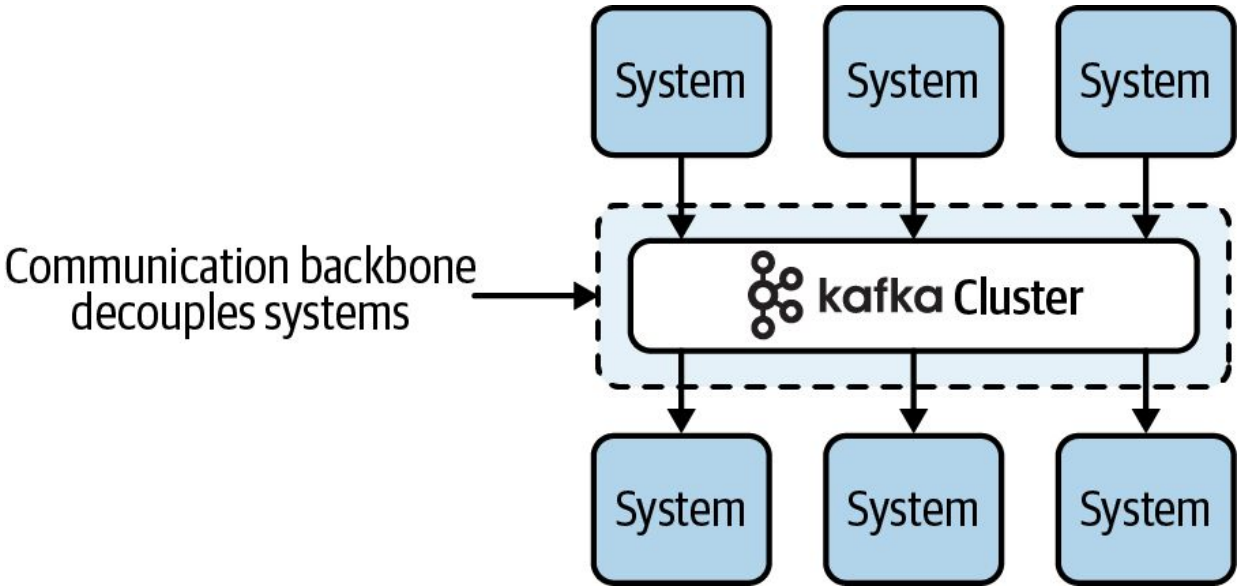
Client-Server Model - challenges

1. Cross language communication
2. Service-discovery
3. Load-balancing
4. Network-latency
5. Reliability
6. Versioning & Compatibility

Introducing Kafka's Communication Model

Kafka as a Central Communication Hub

- Decentralizes and simplifies system communication
- Publish-subscribe model replaces direct interactions

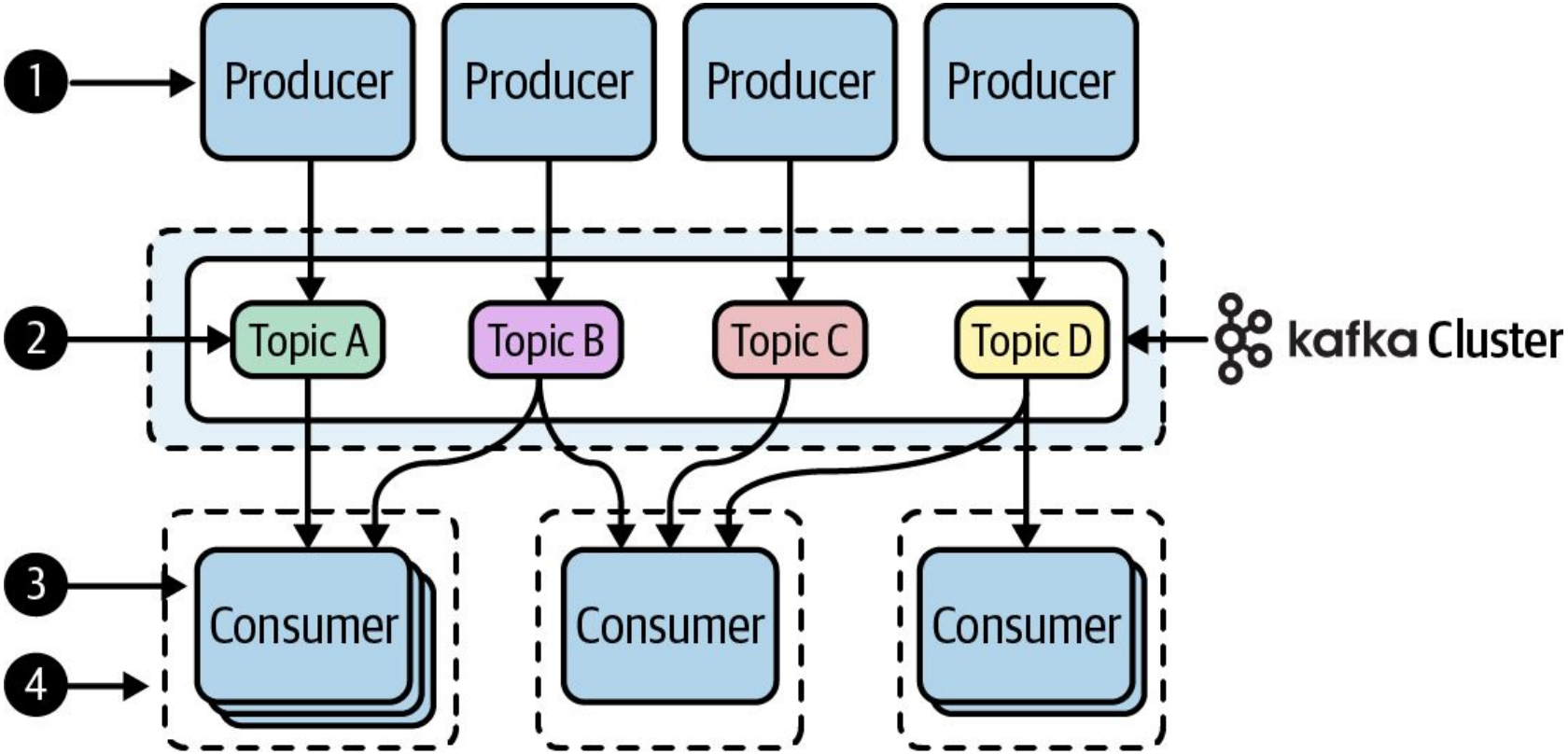


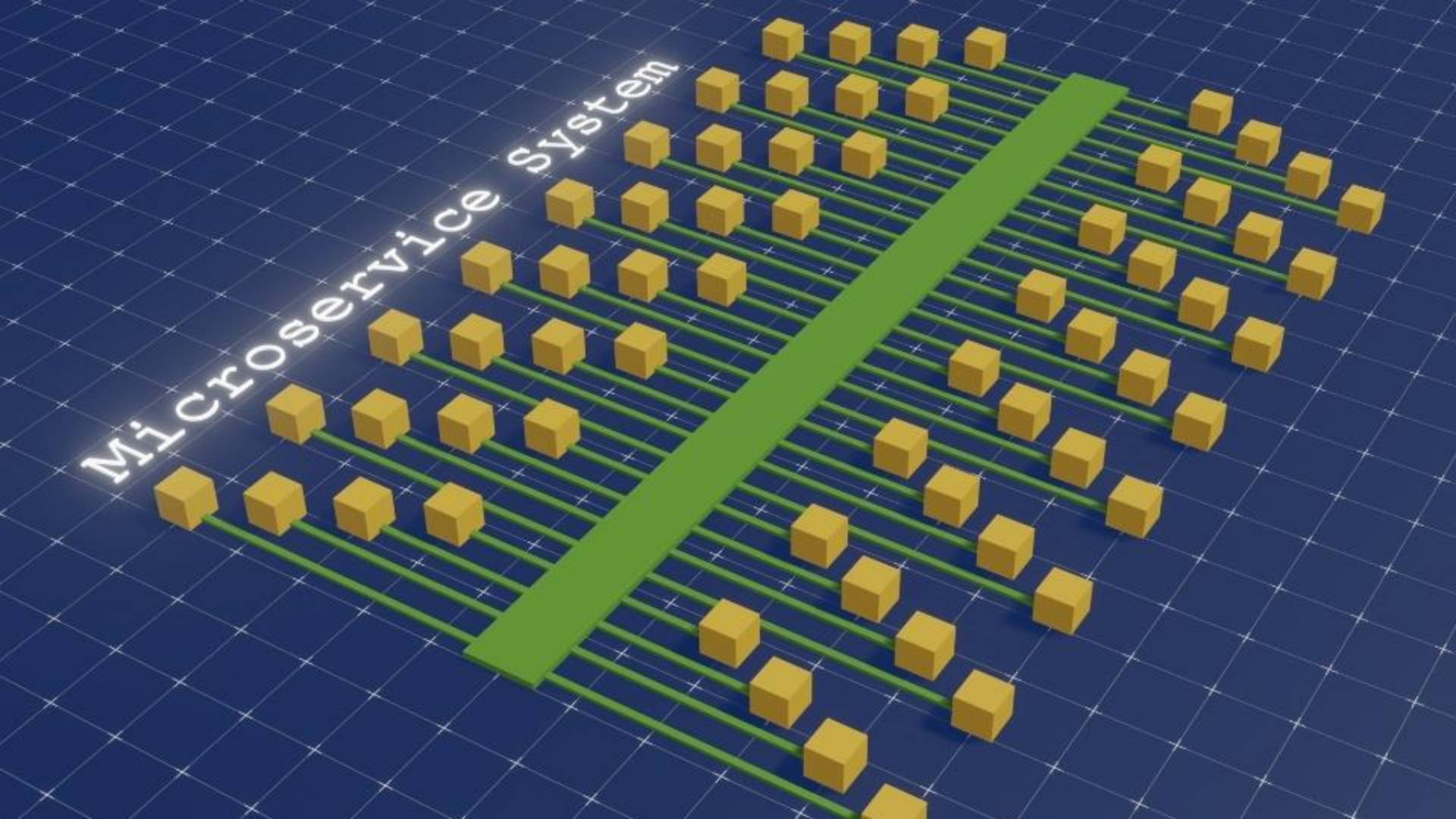
Kafka’s Publish-Subscribe Mechanics

Understanding Kafka's Pub/Sub Model

- Producers publish data to topics without knowing the consumers
- Consumers subscribe to topics of interest, decoupling from producers
- Consumer groups for distributed processing and fault tolerance

Understanding Kafka's Pub/Sub Model

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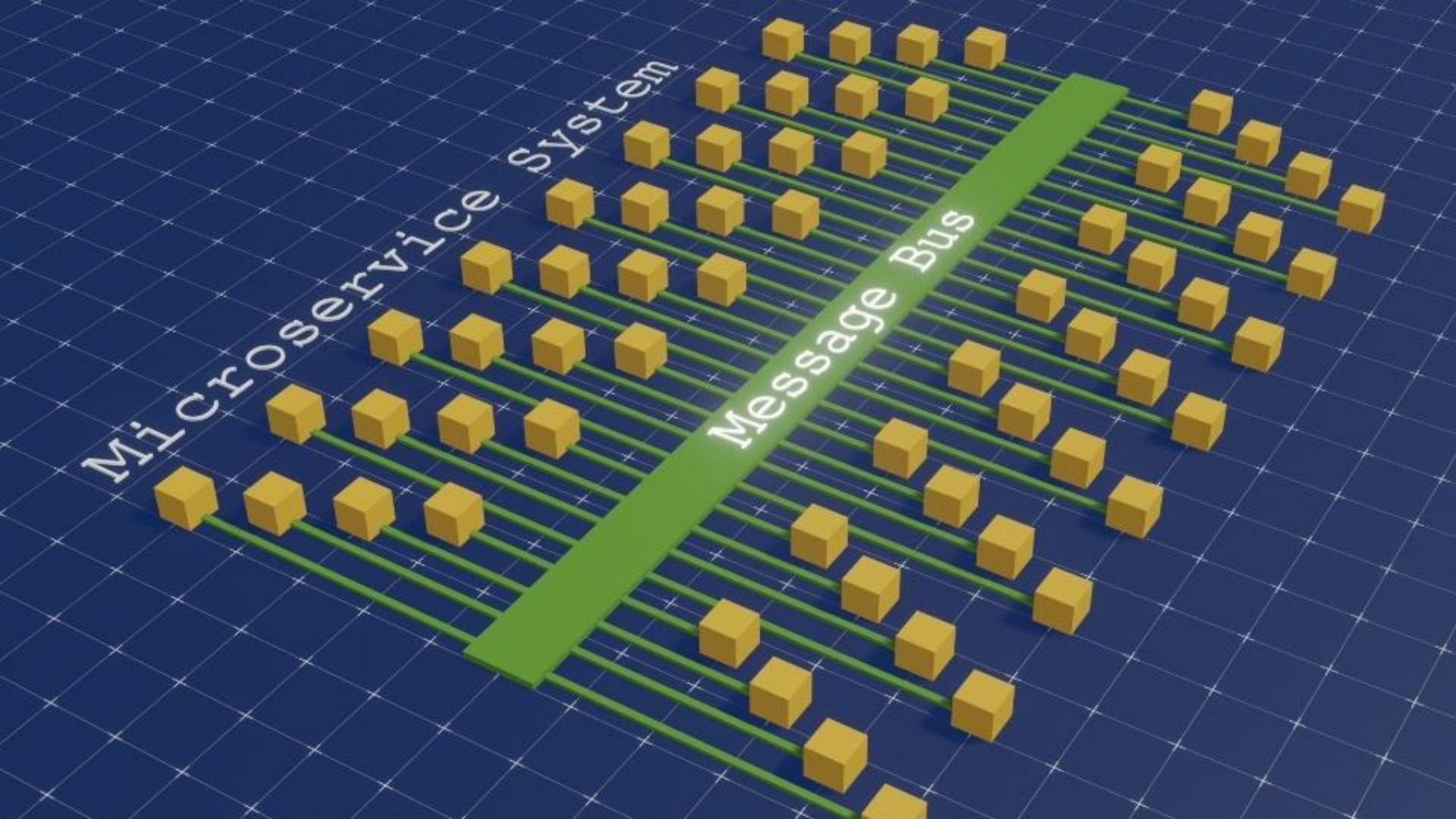
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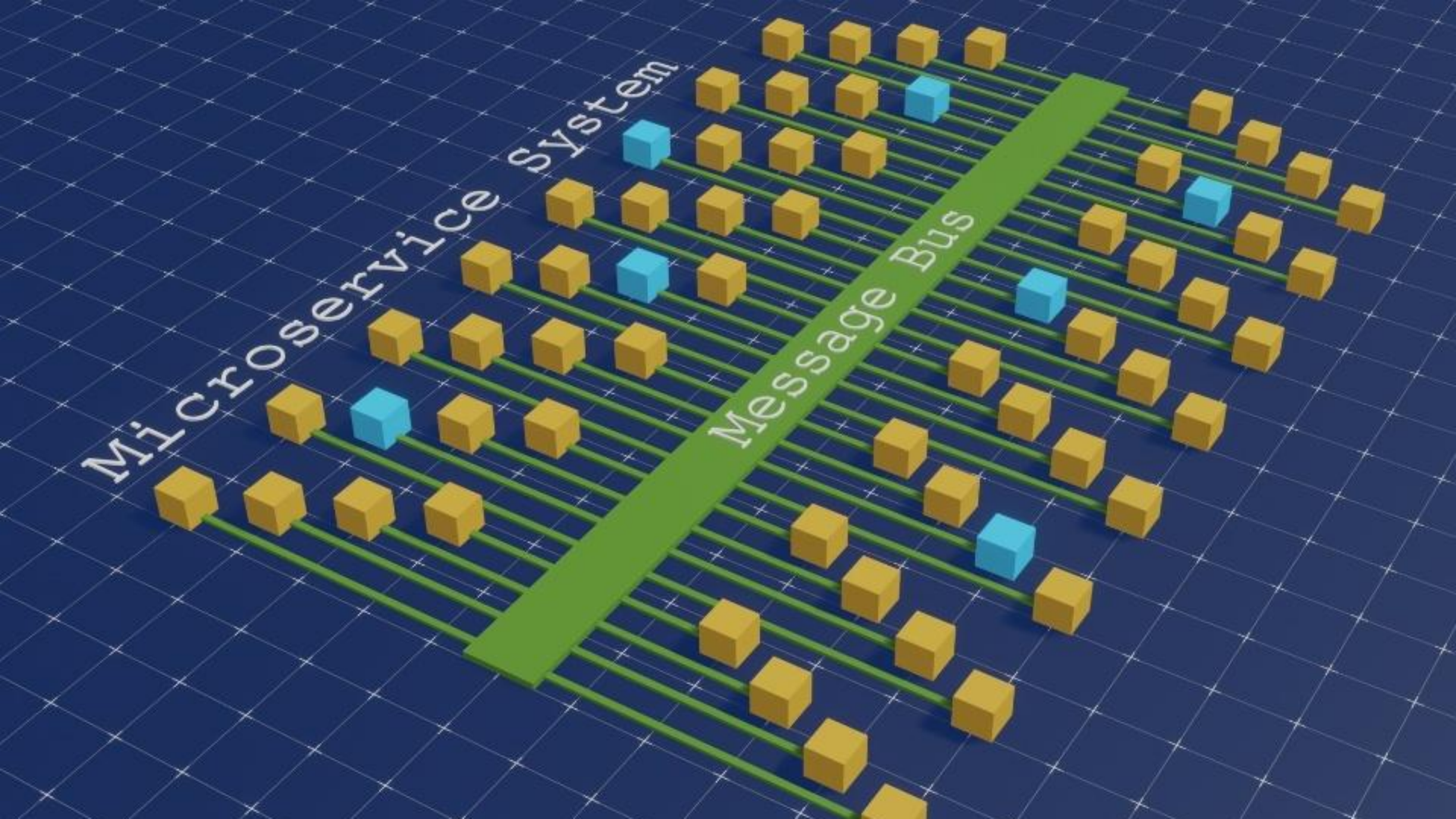
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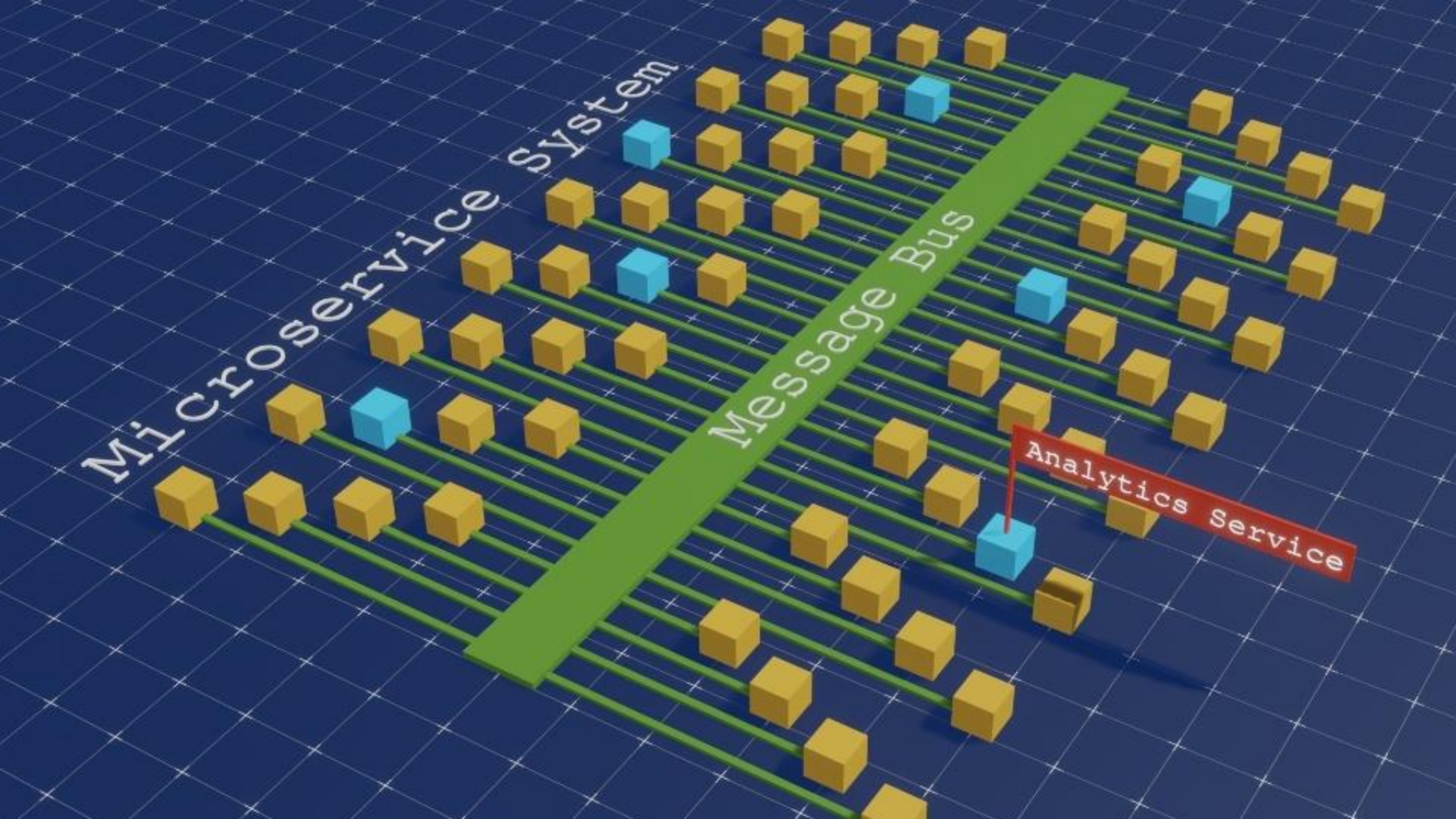
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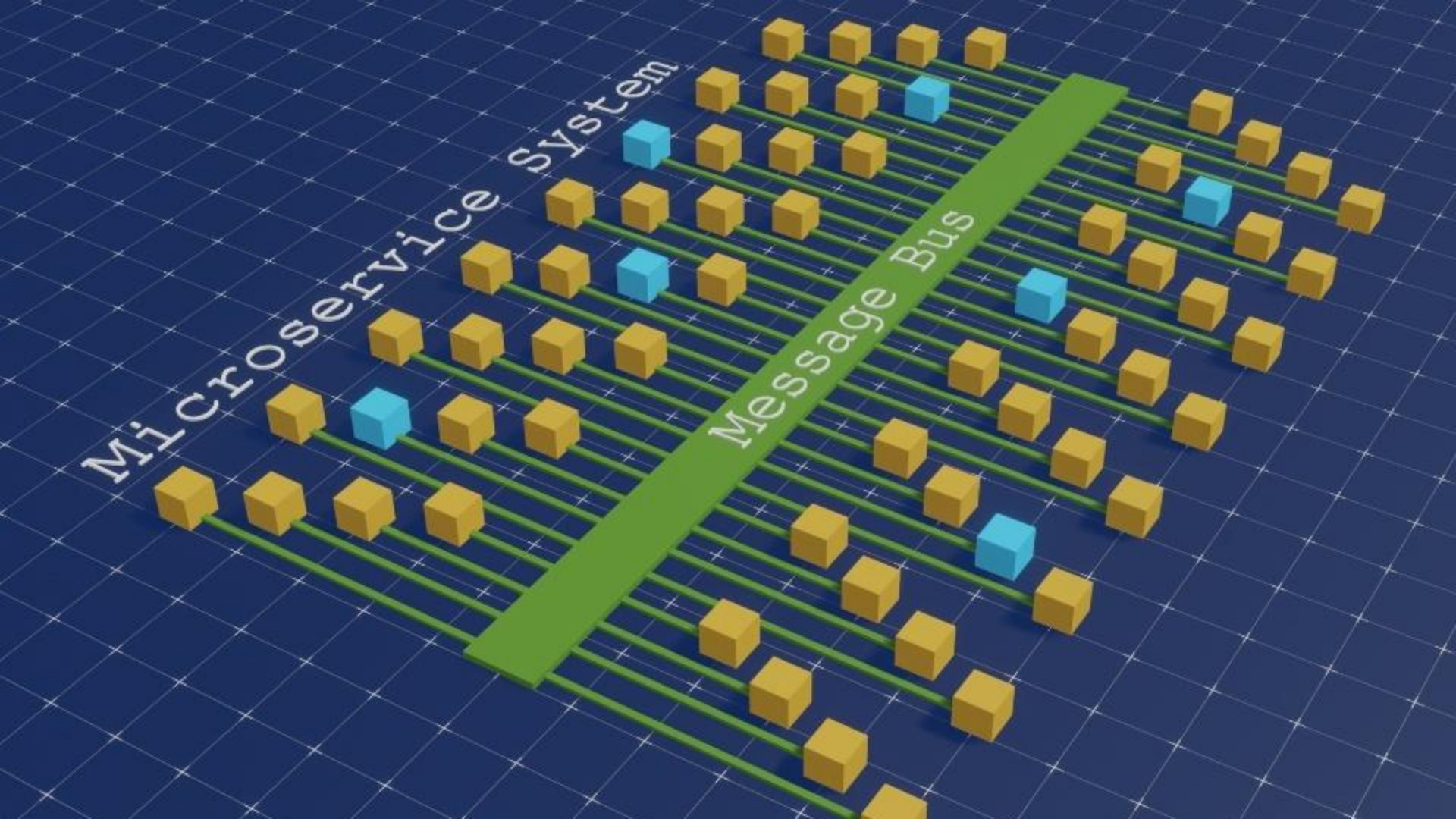
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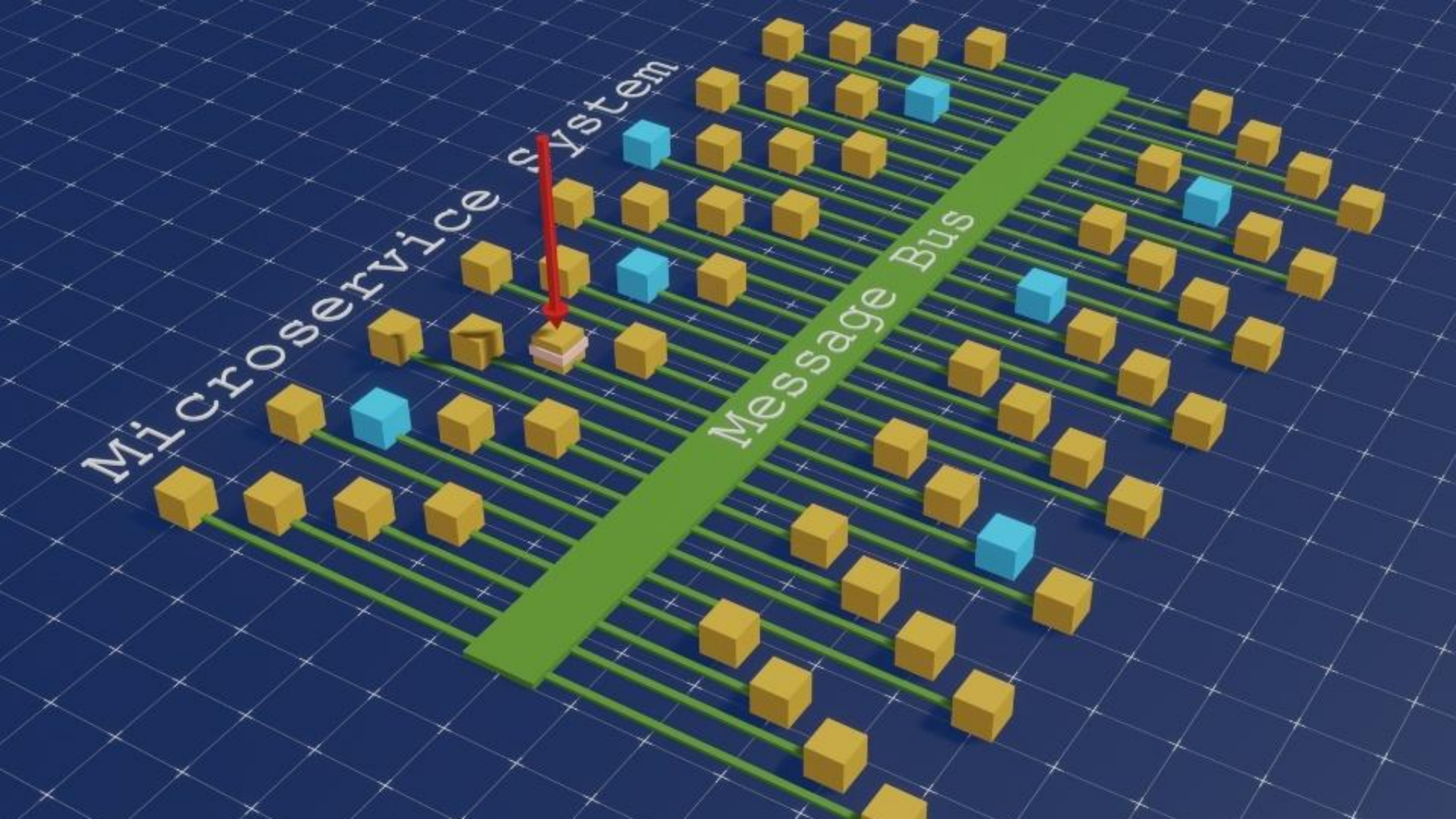
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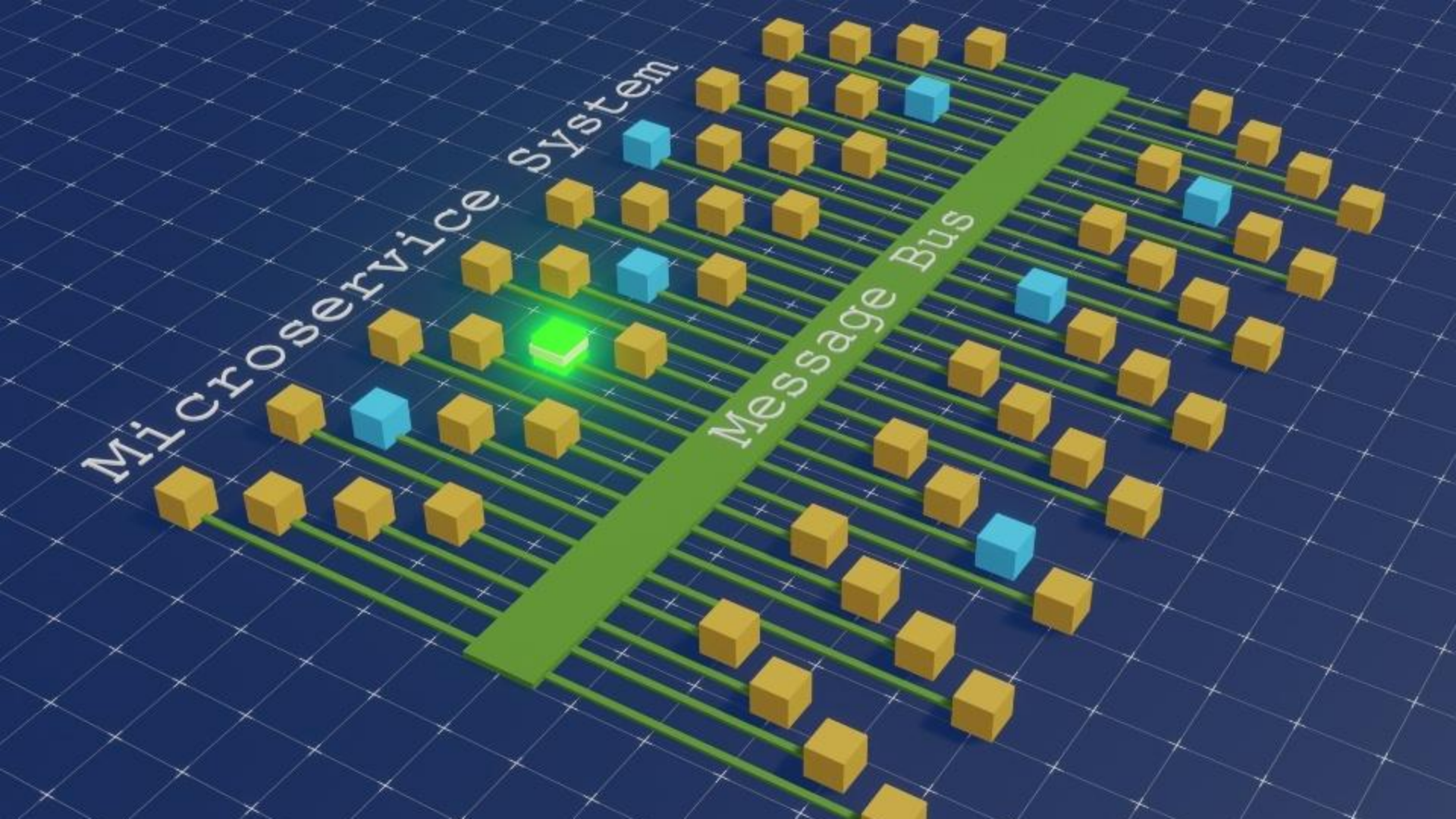
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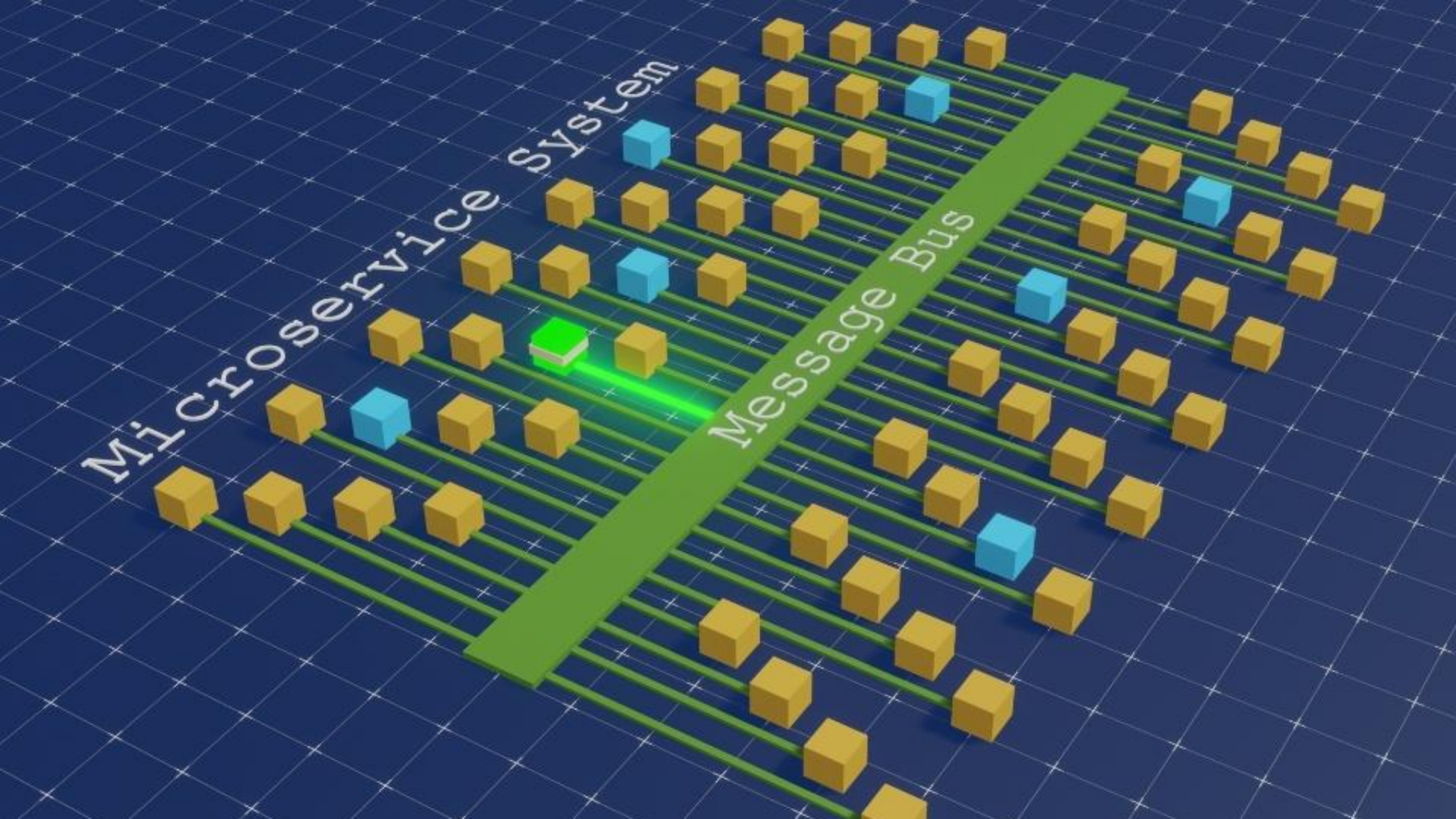
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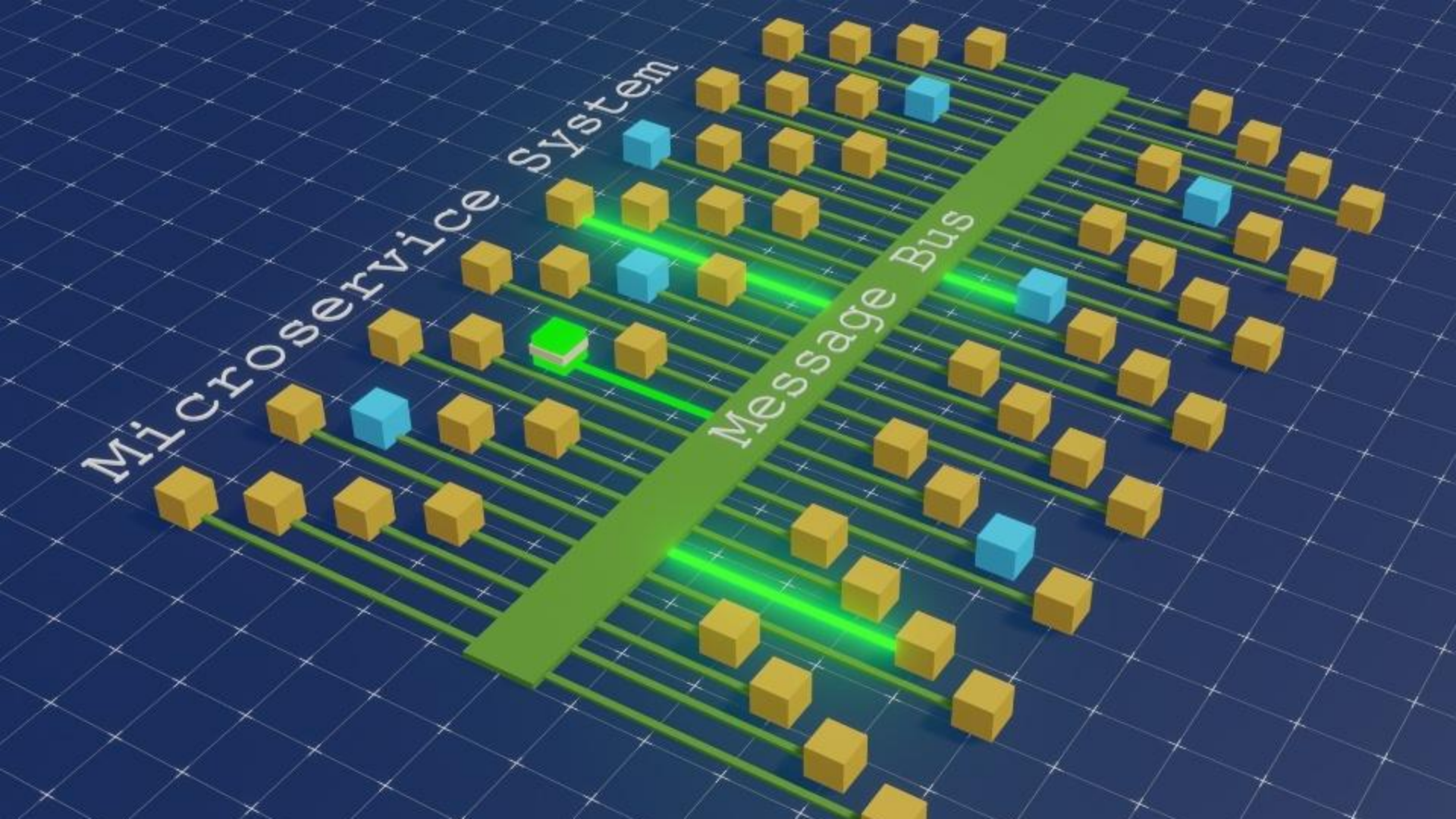
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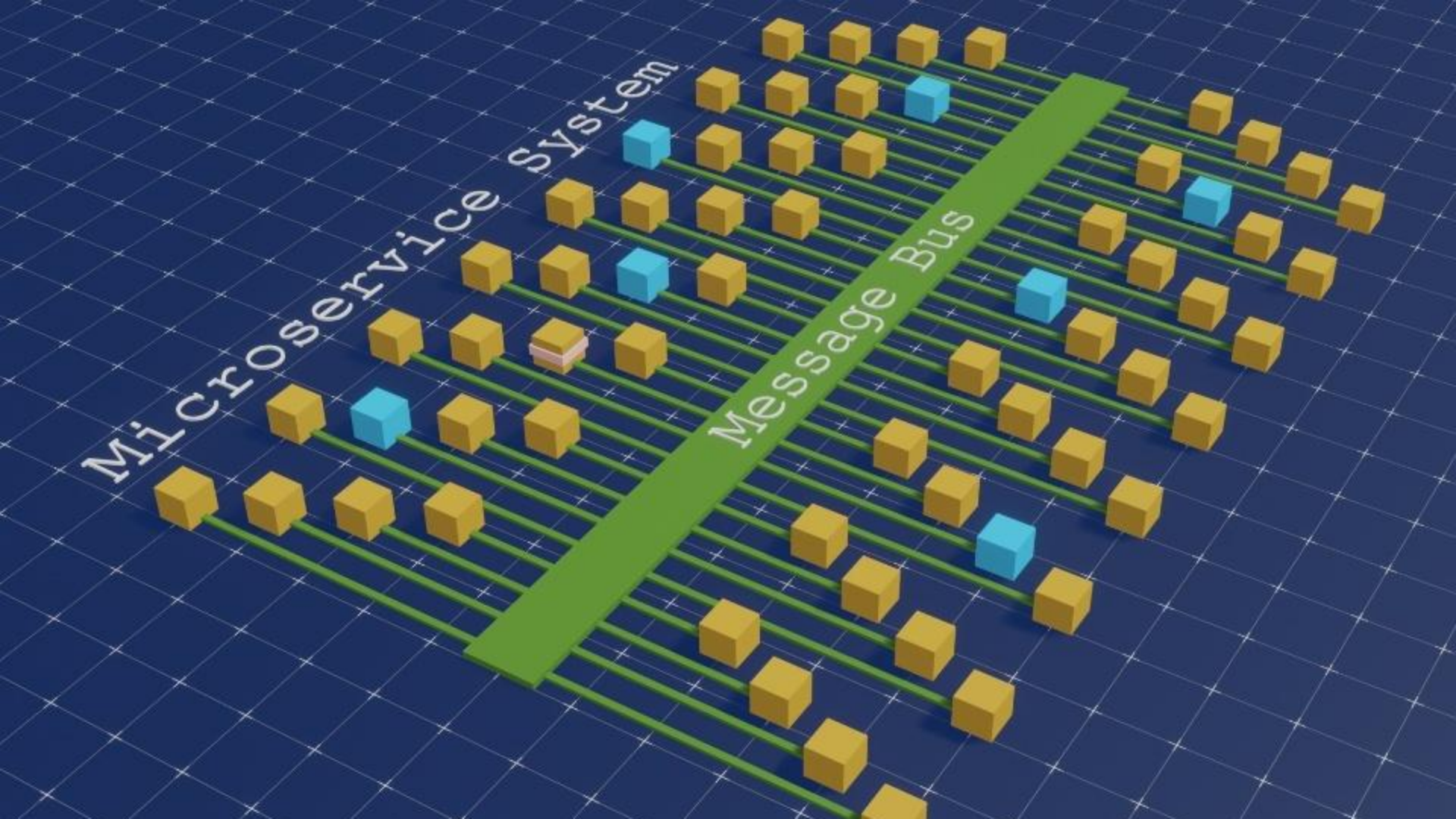
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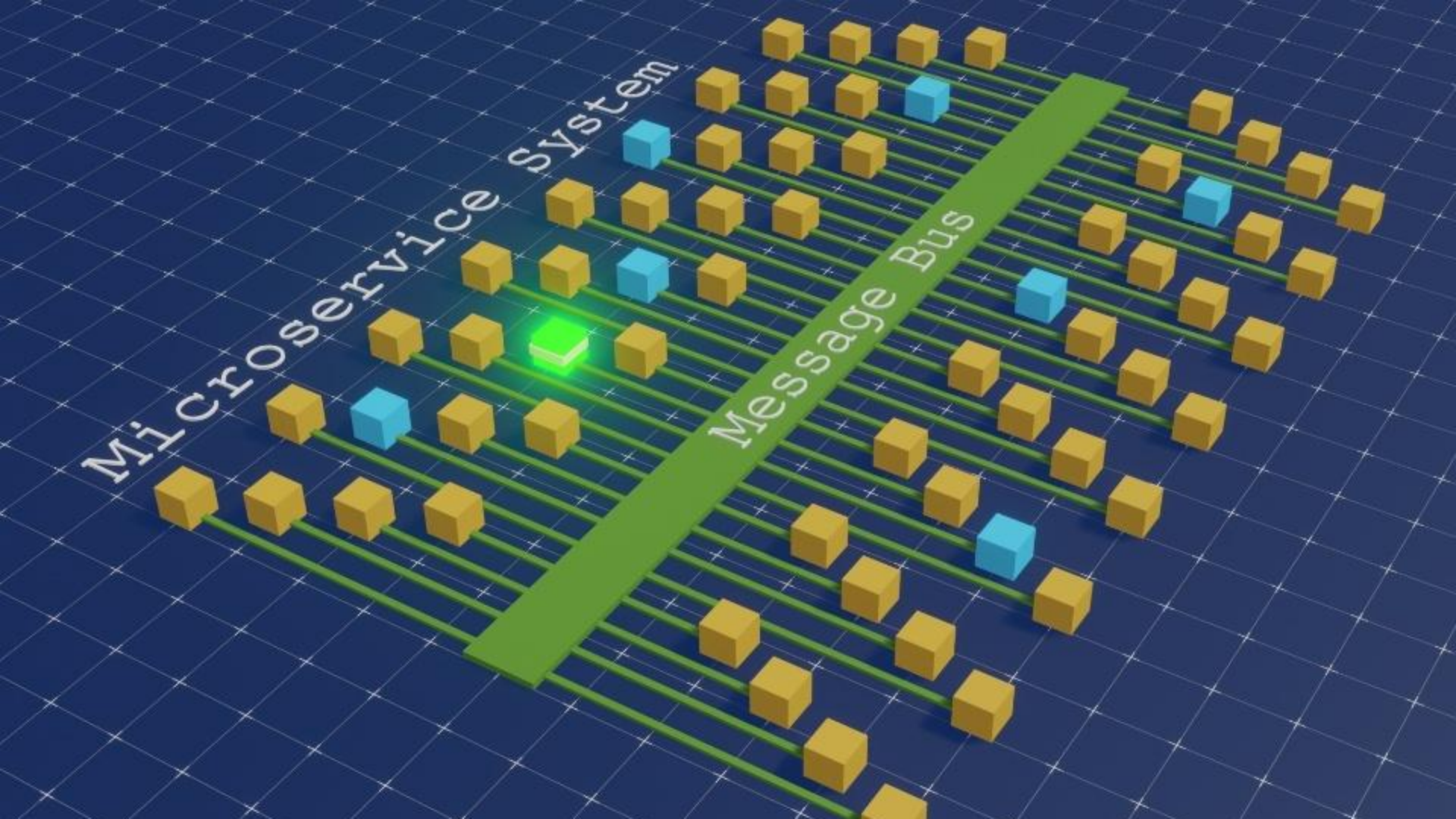
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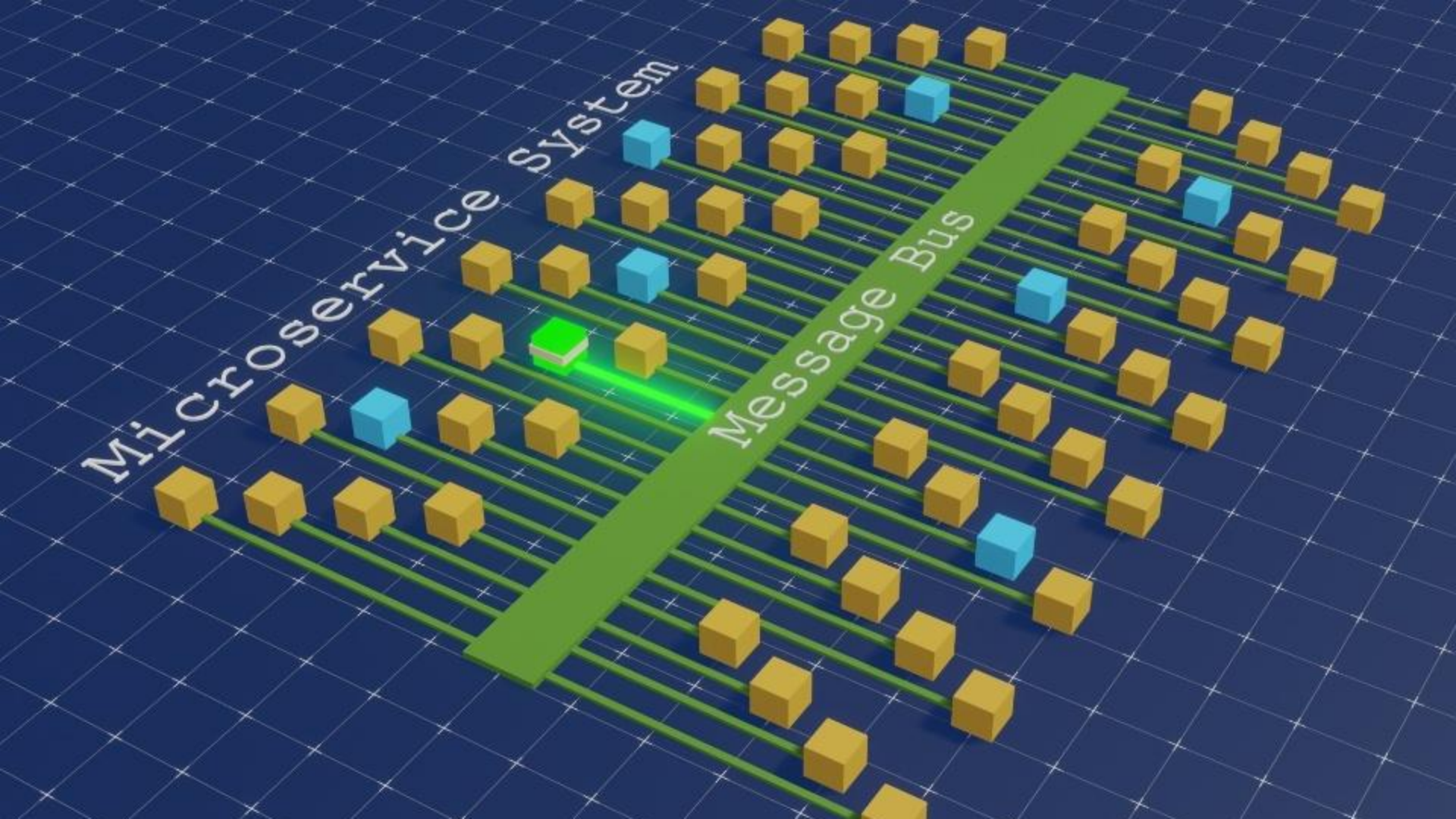
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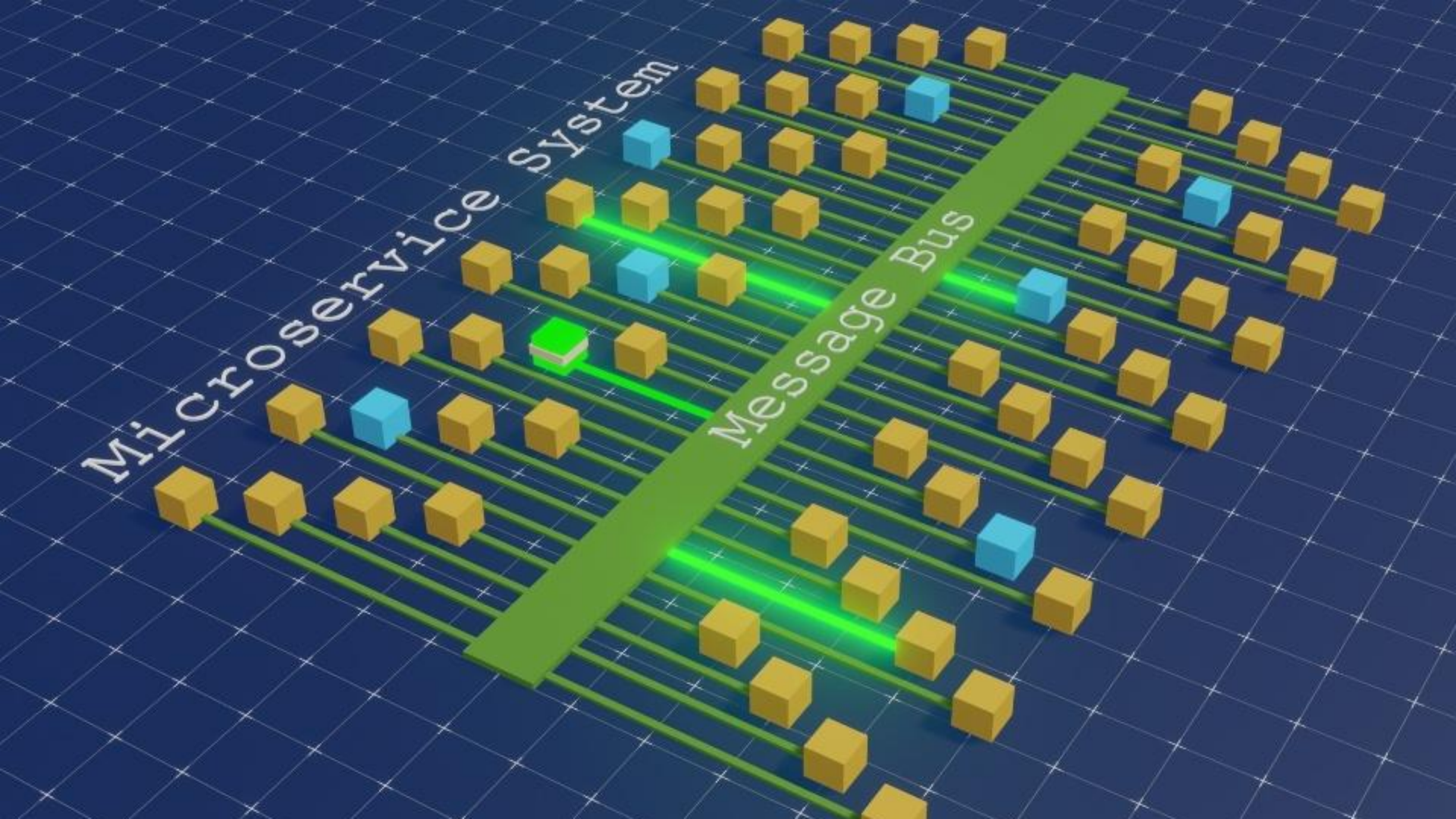
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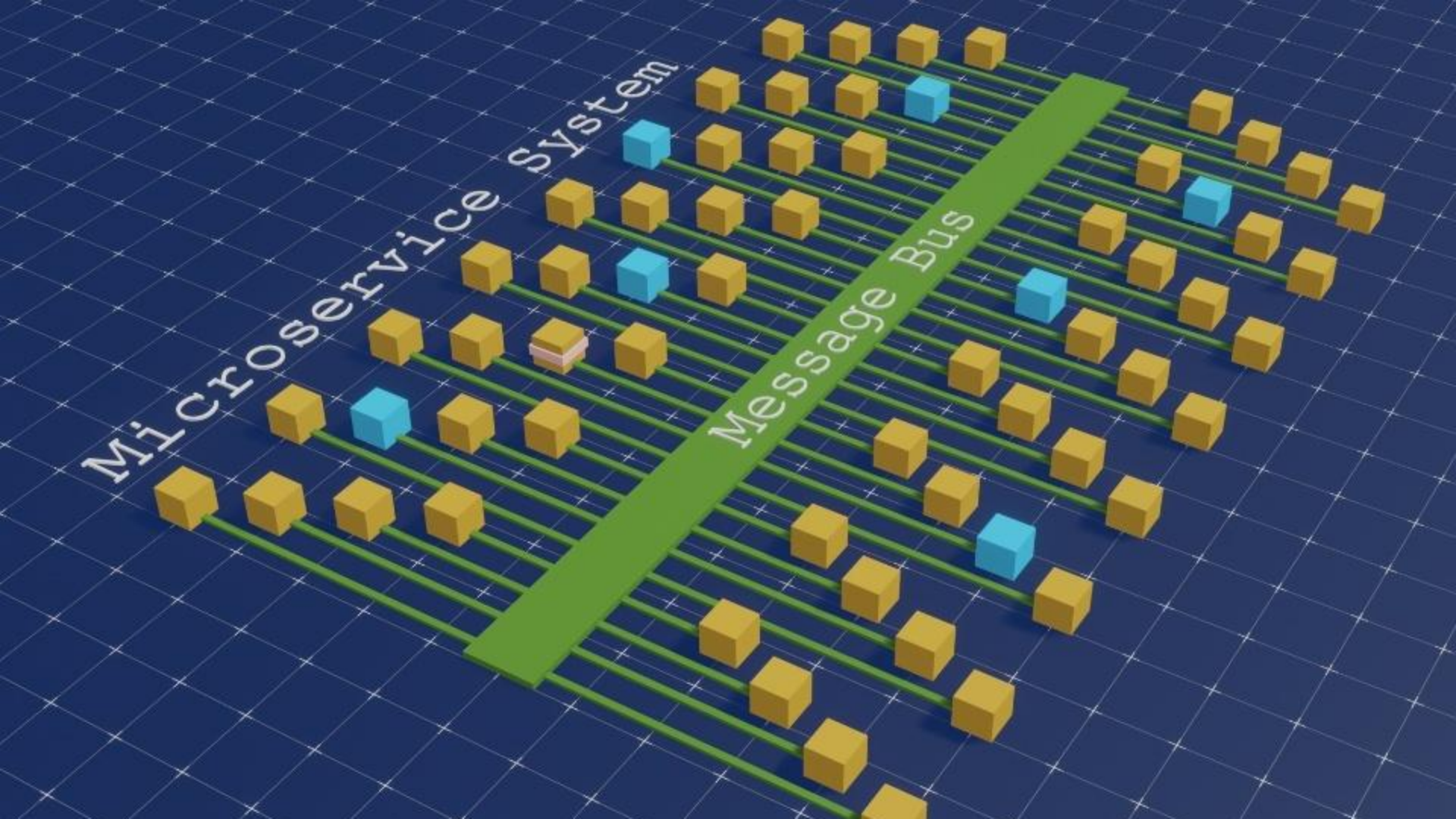
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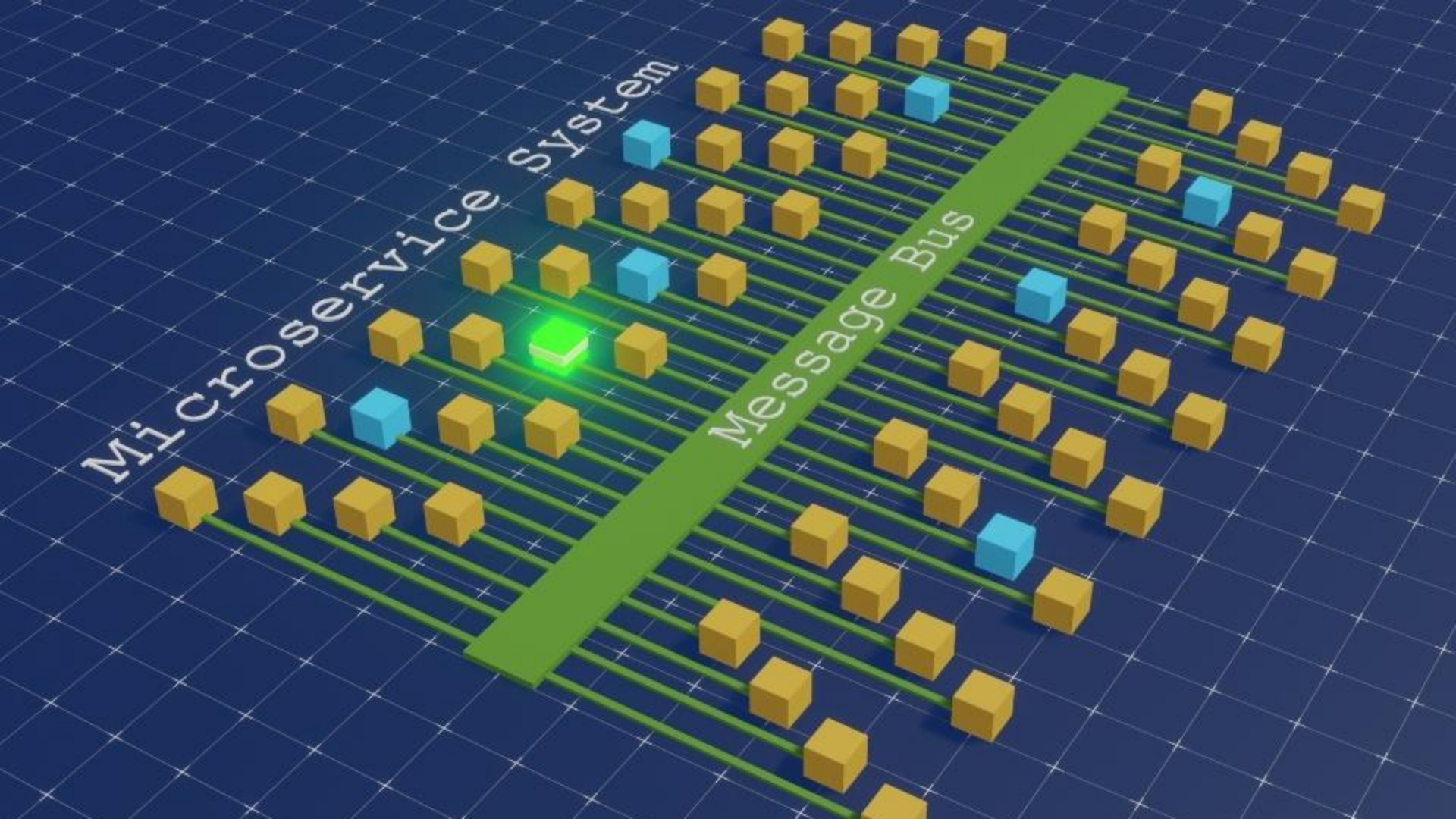
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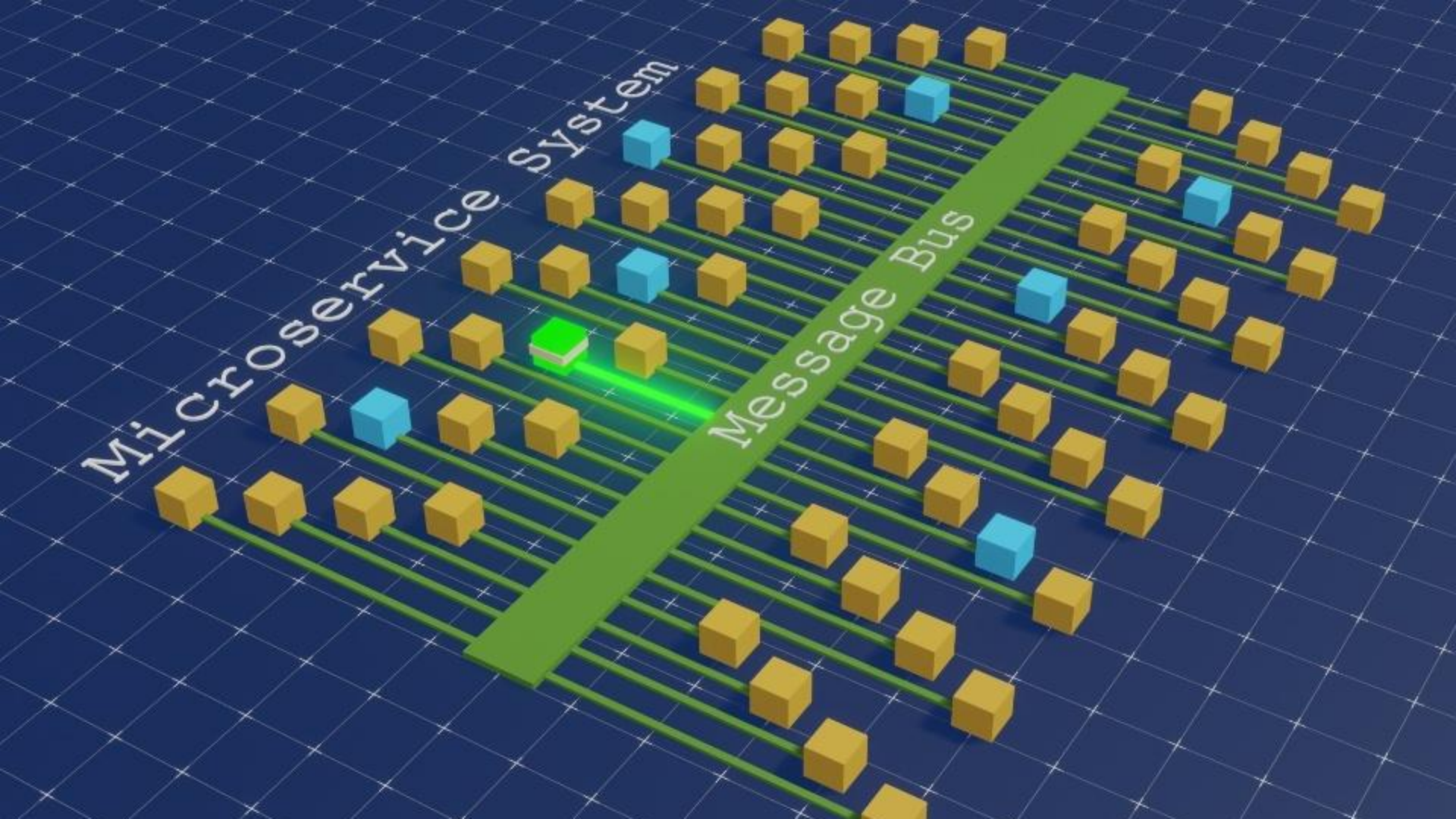
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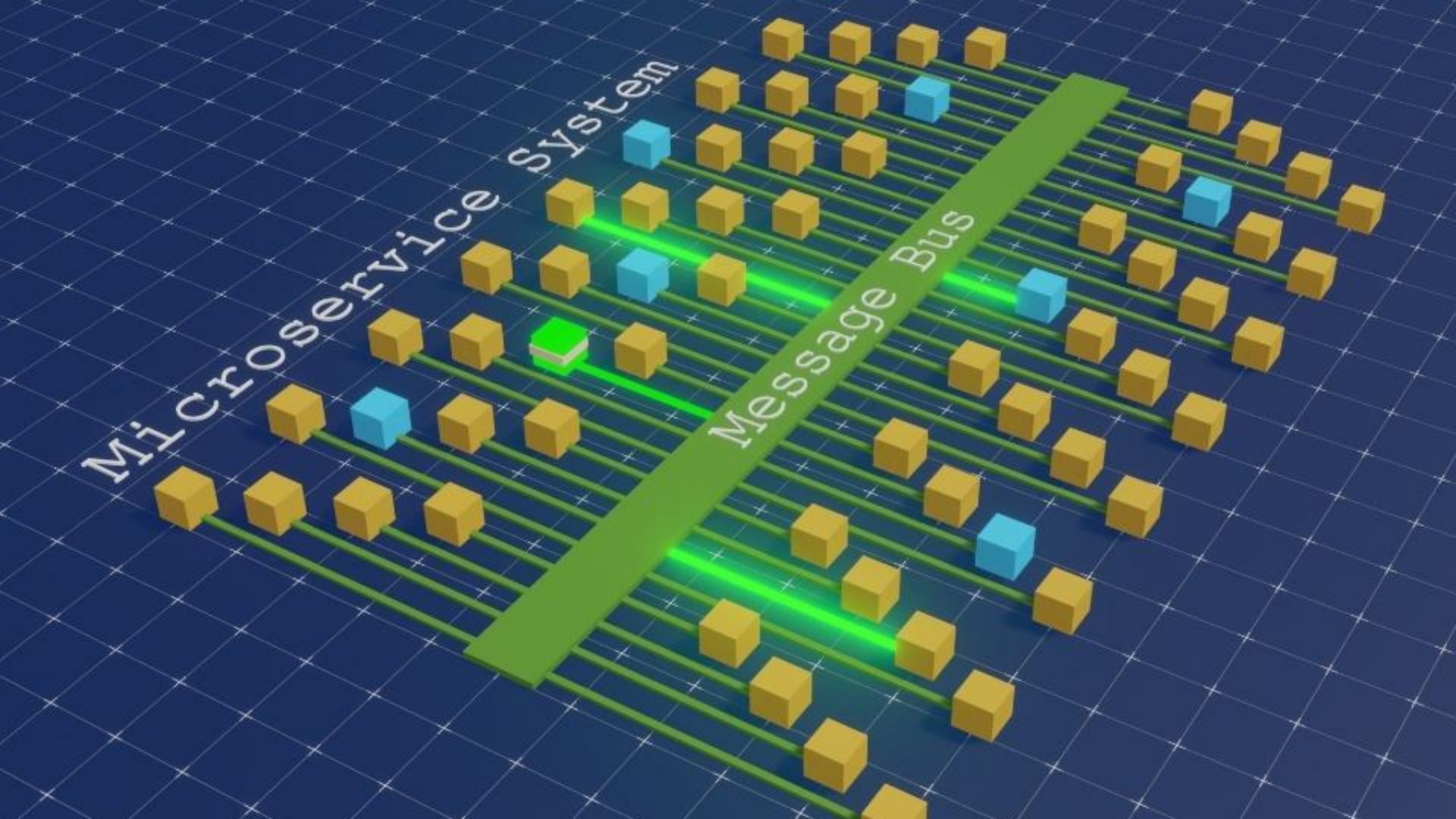
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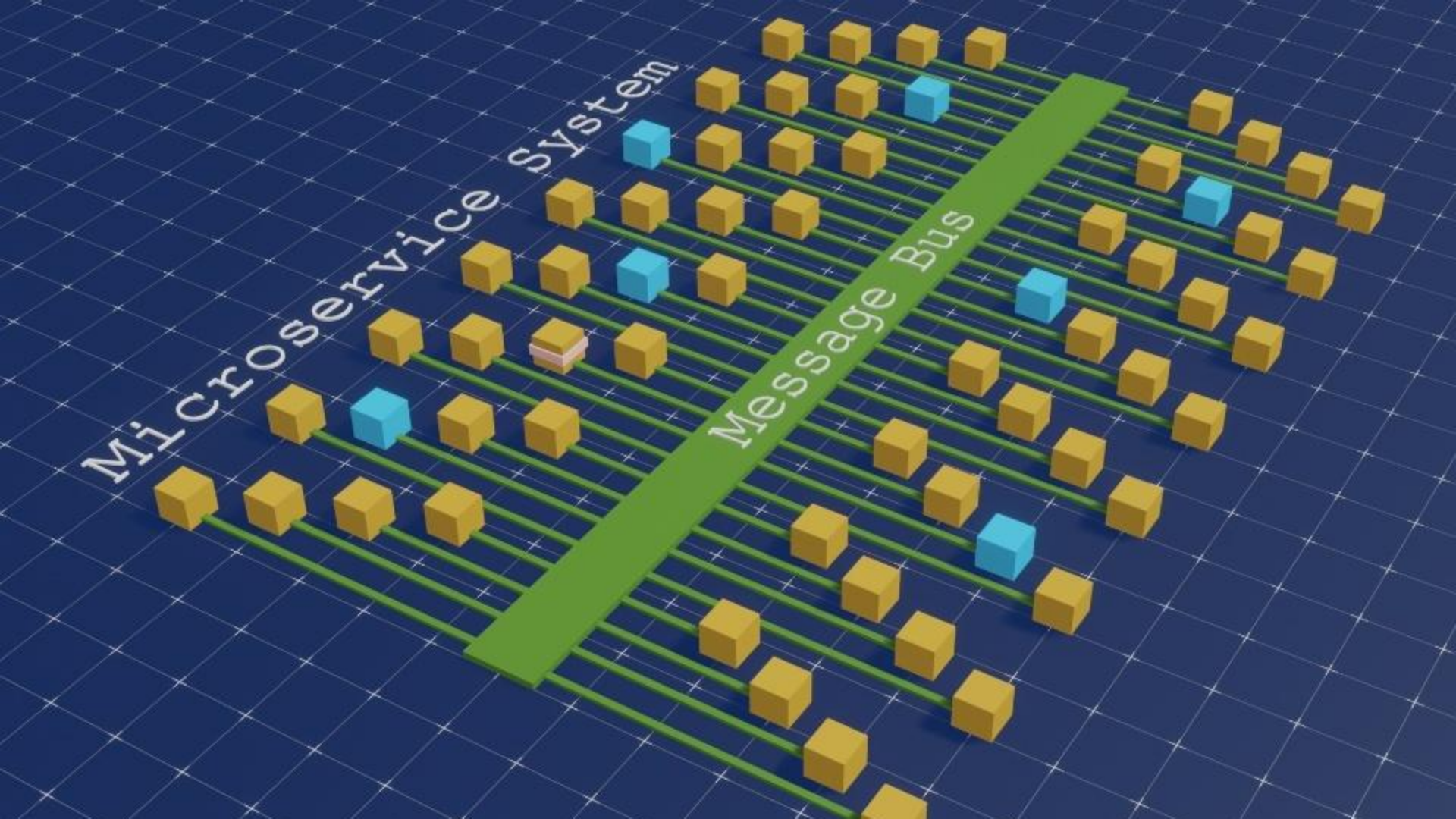
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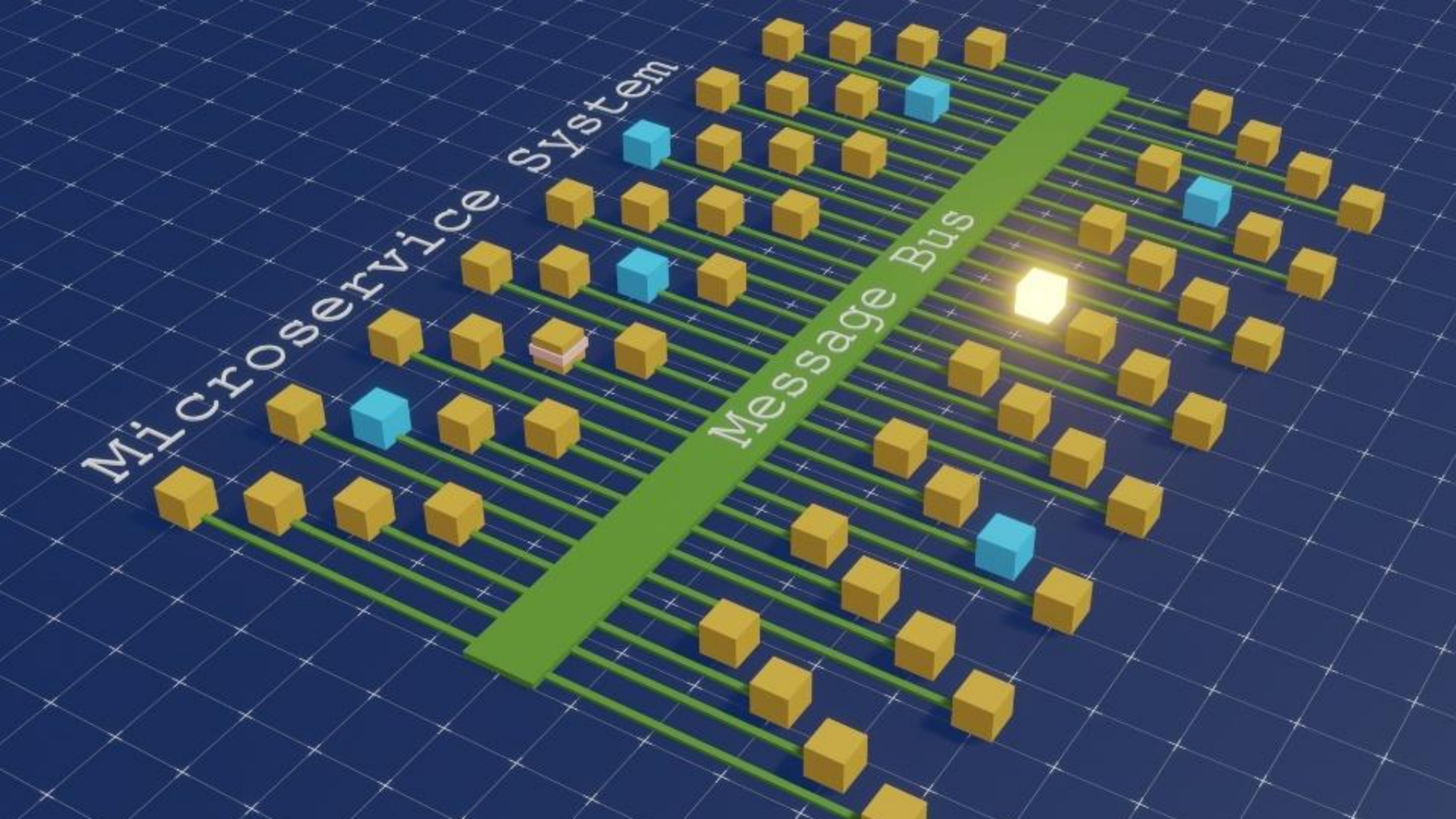
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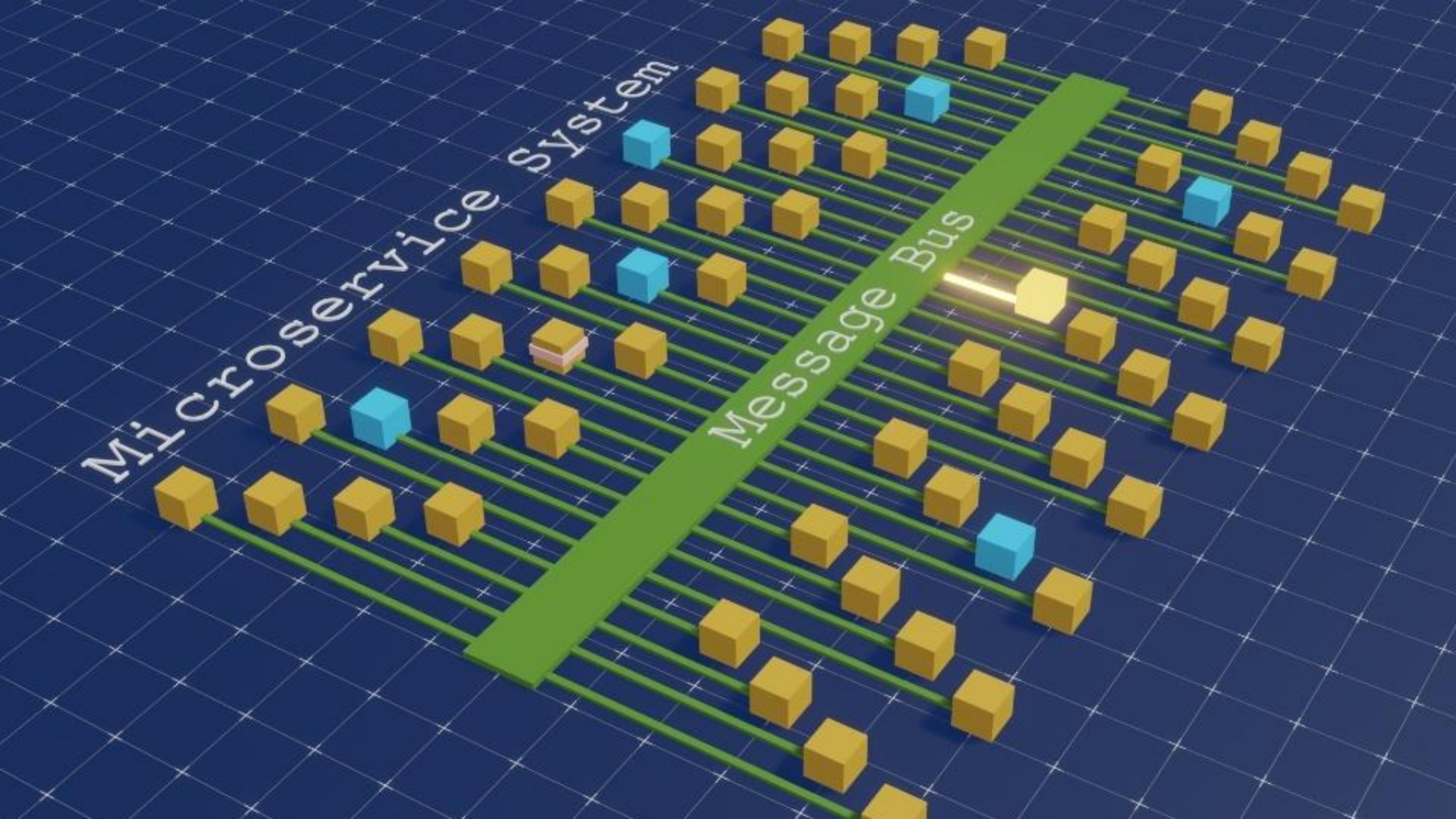
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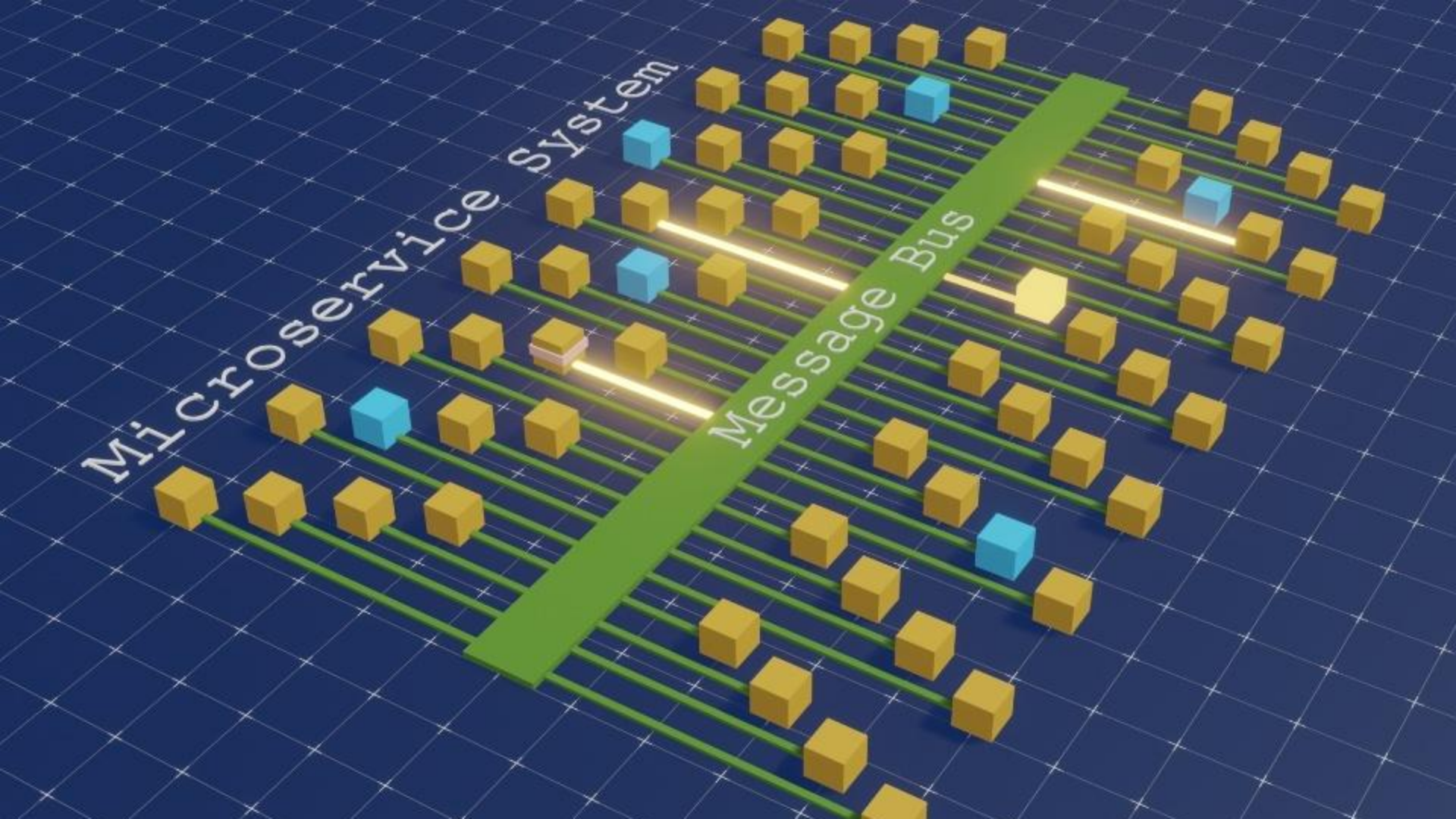
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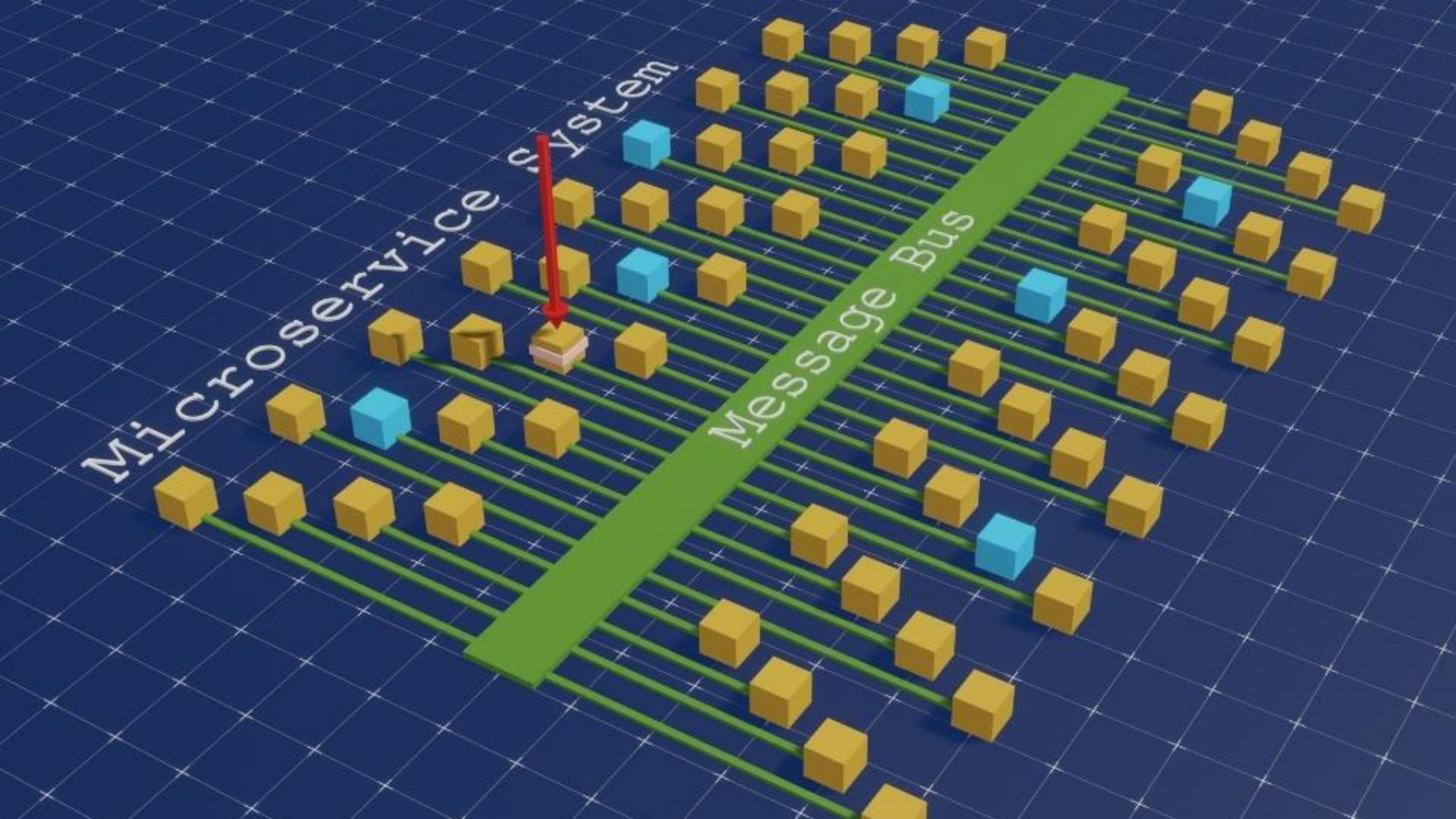
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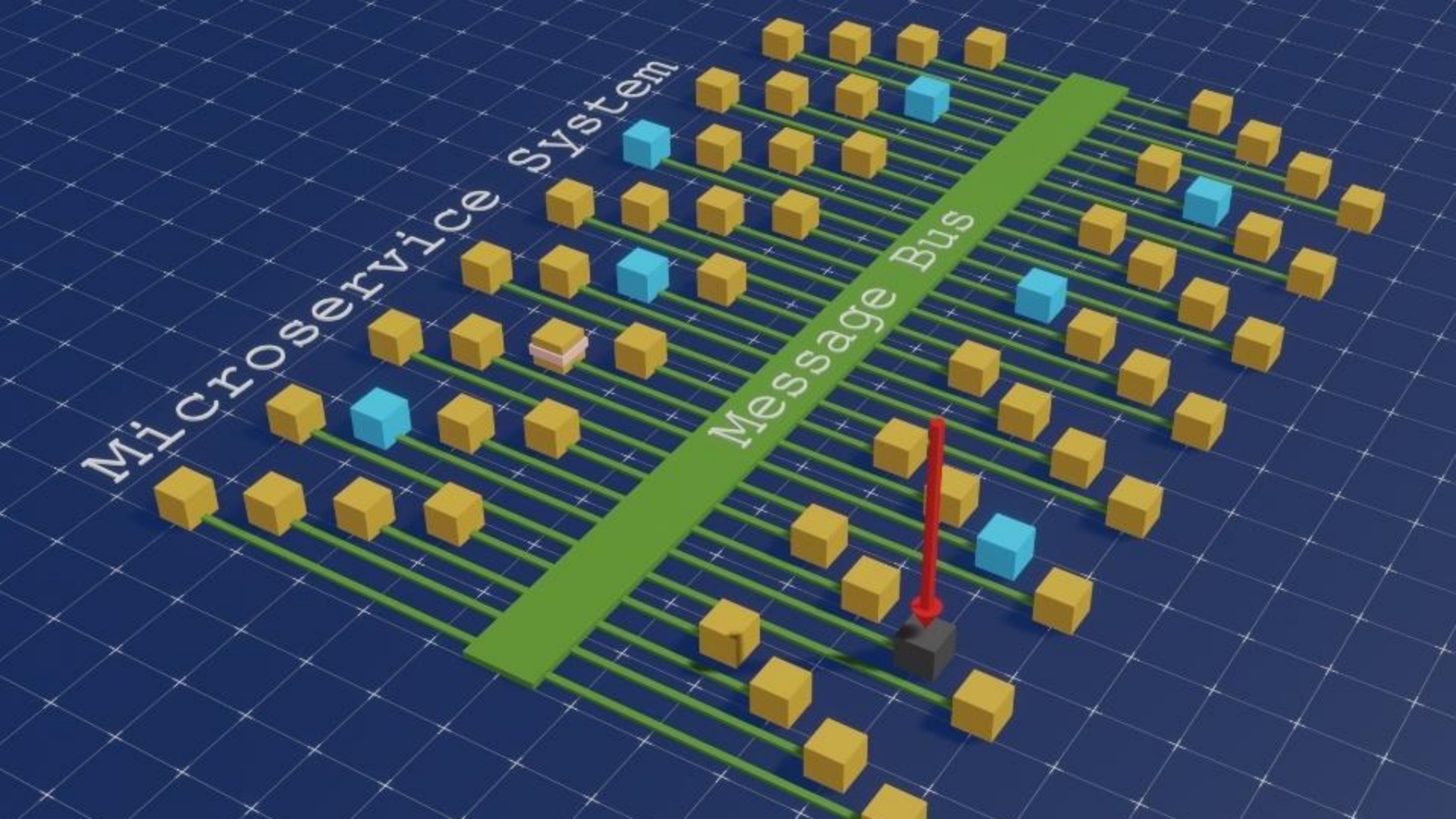
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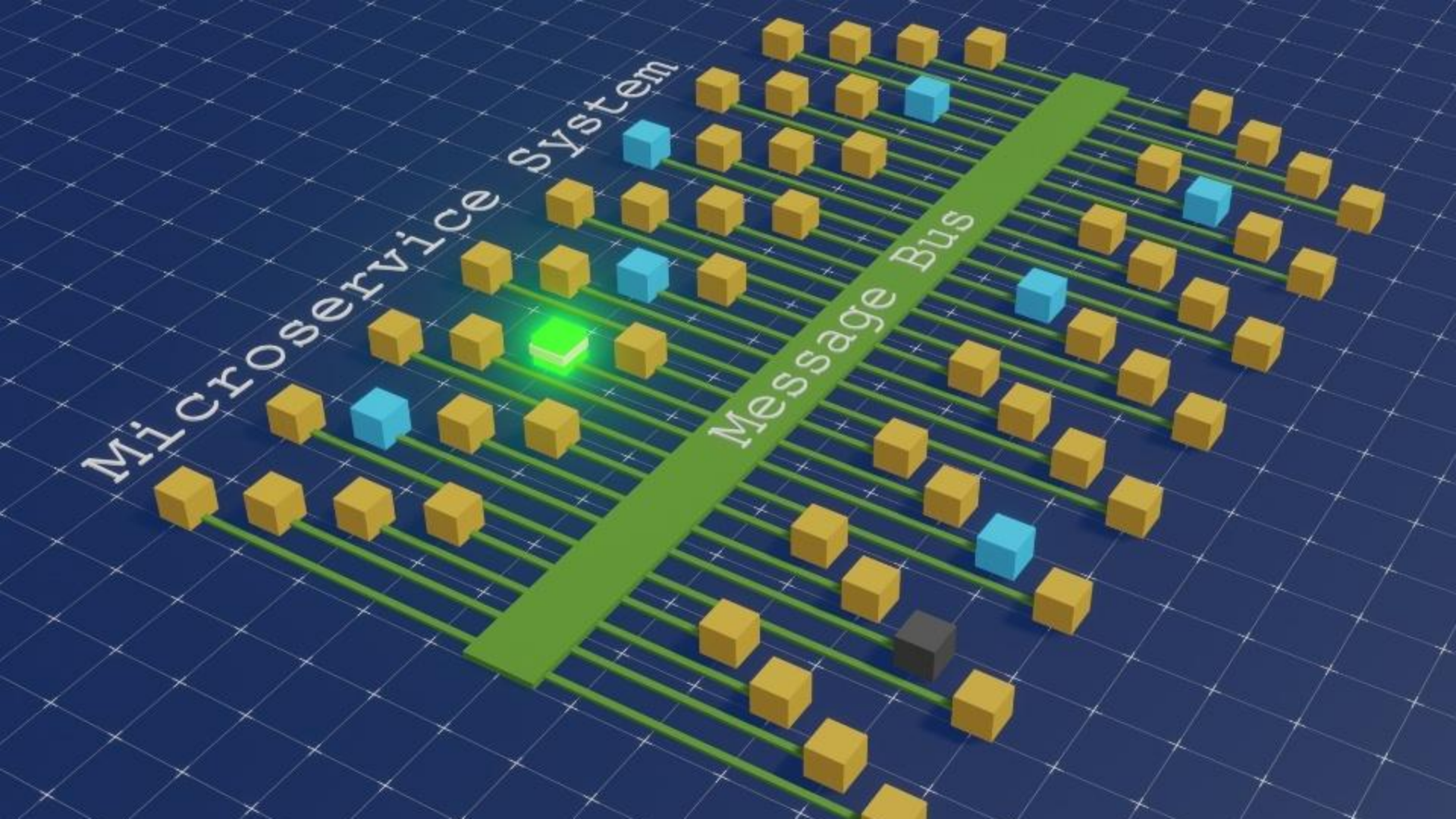
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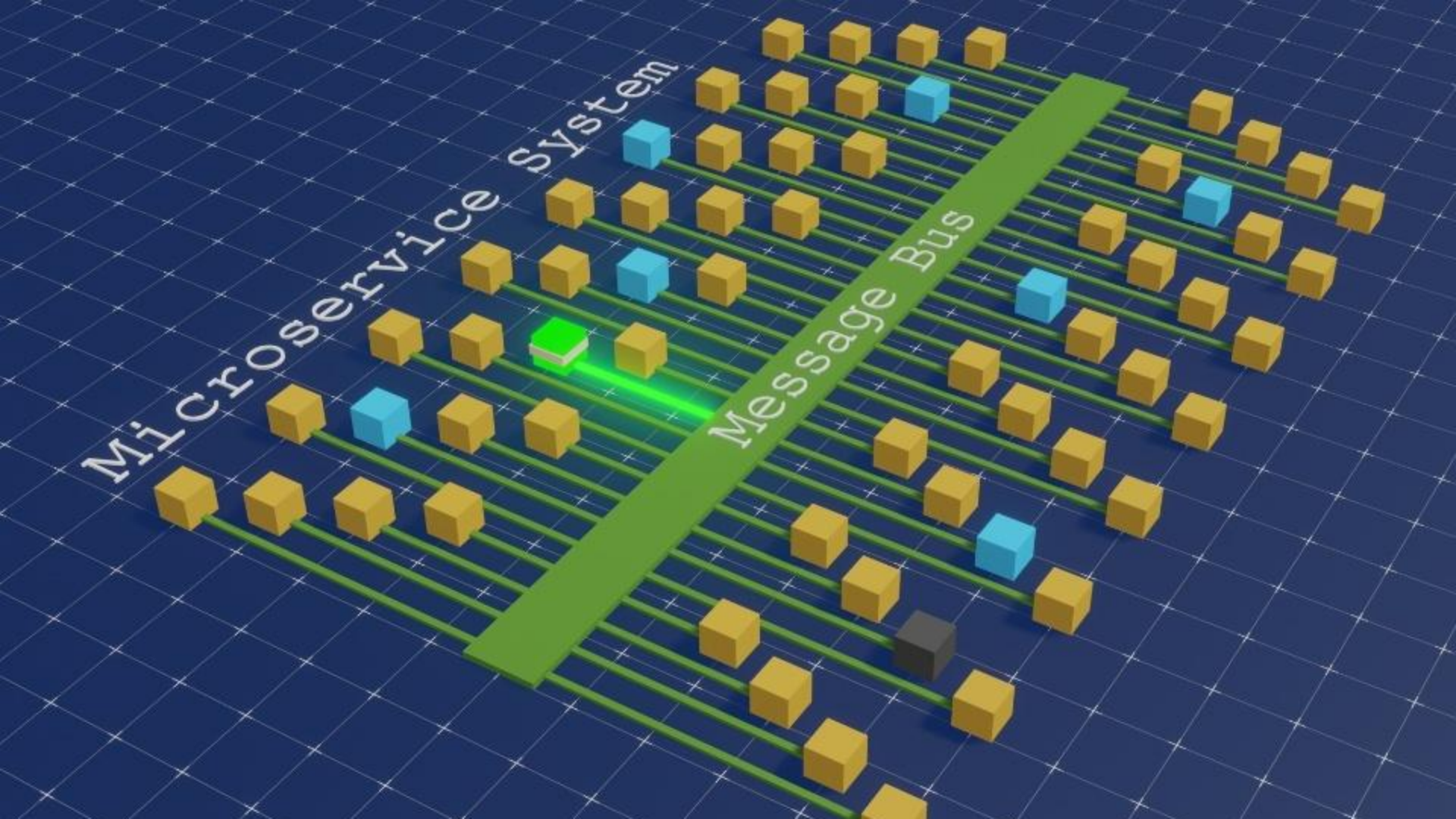
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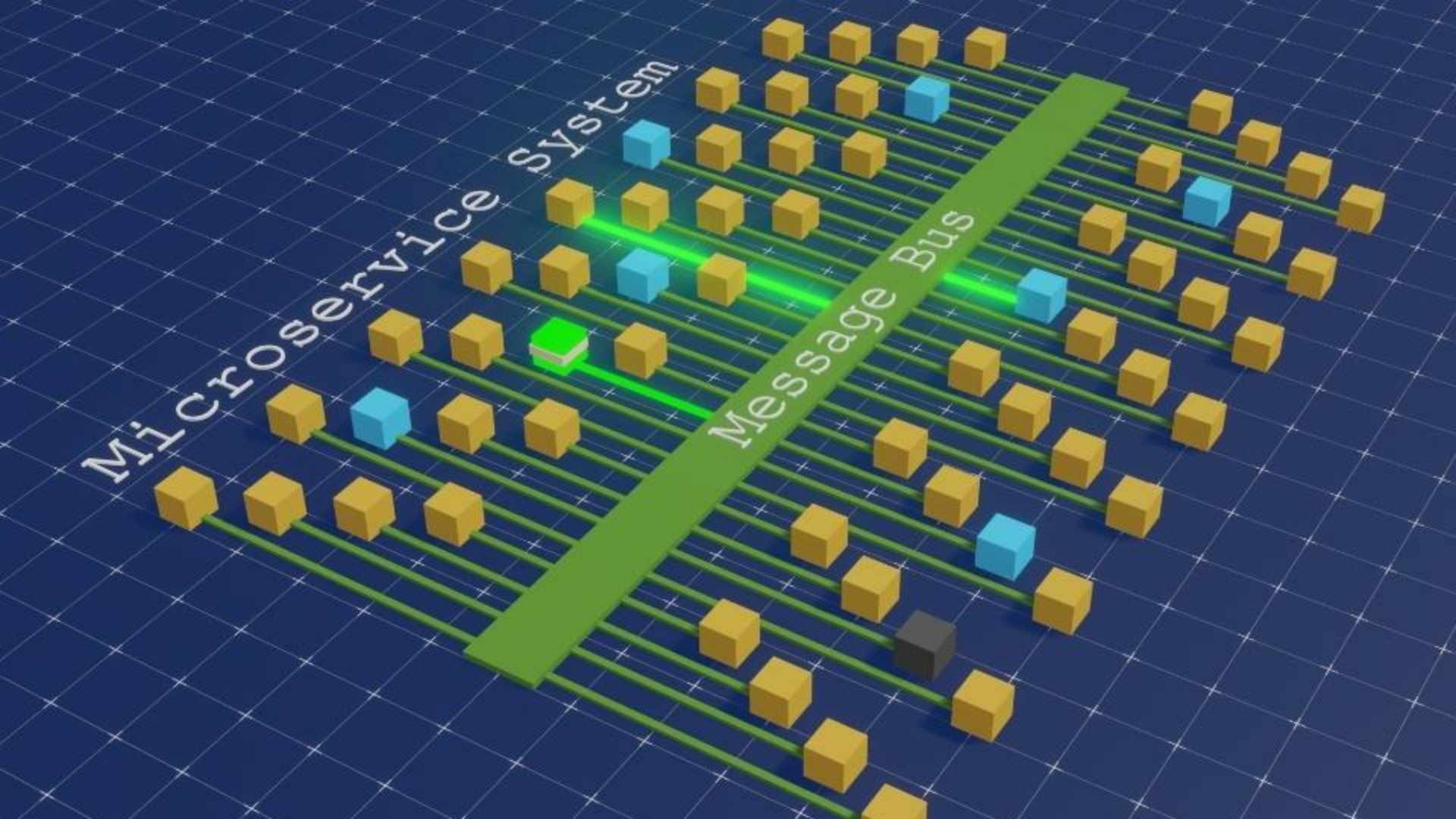
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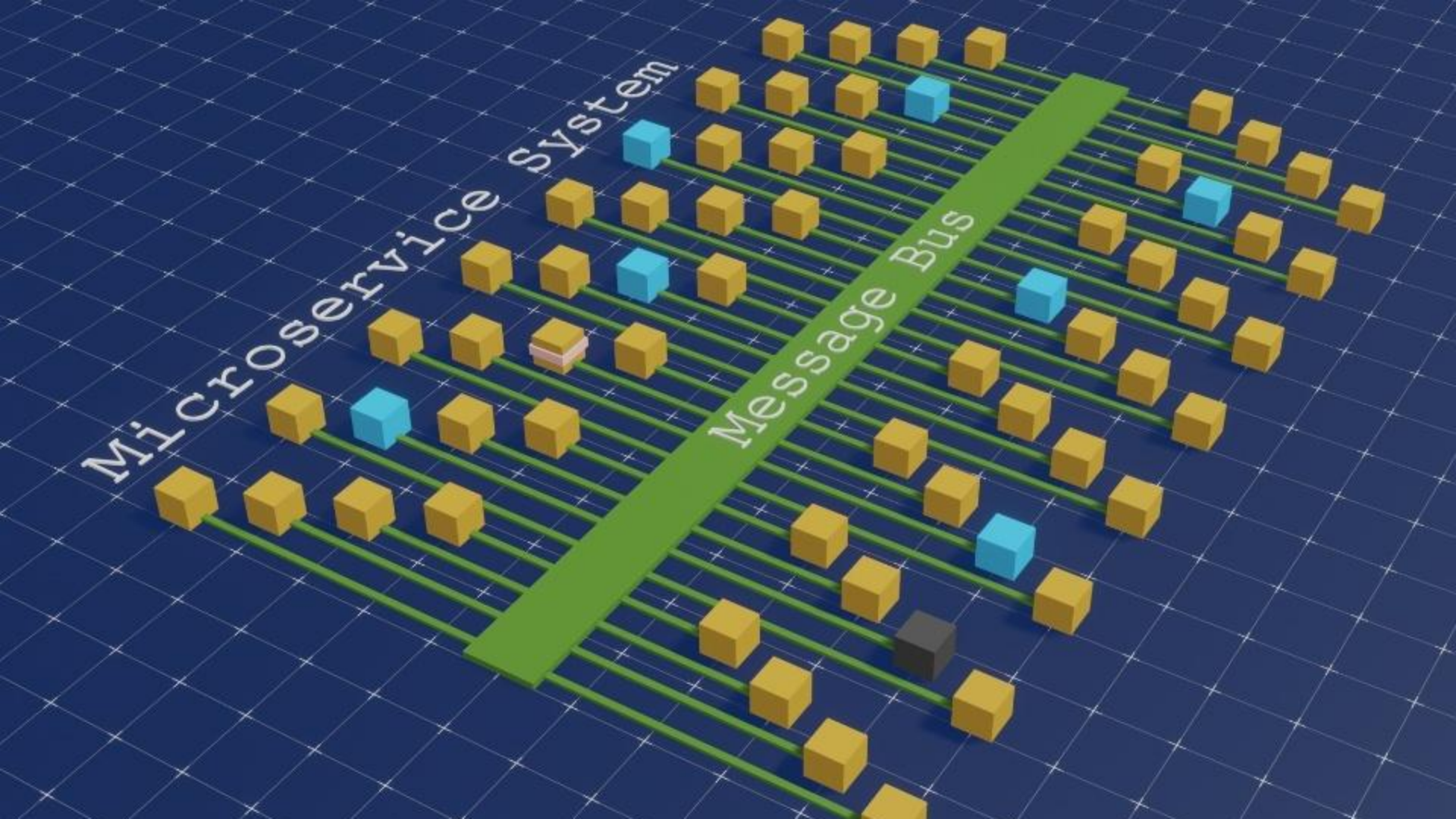
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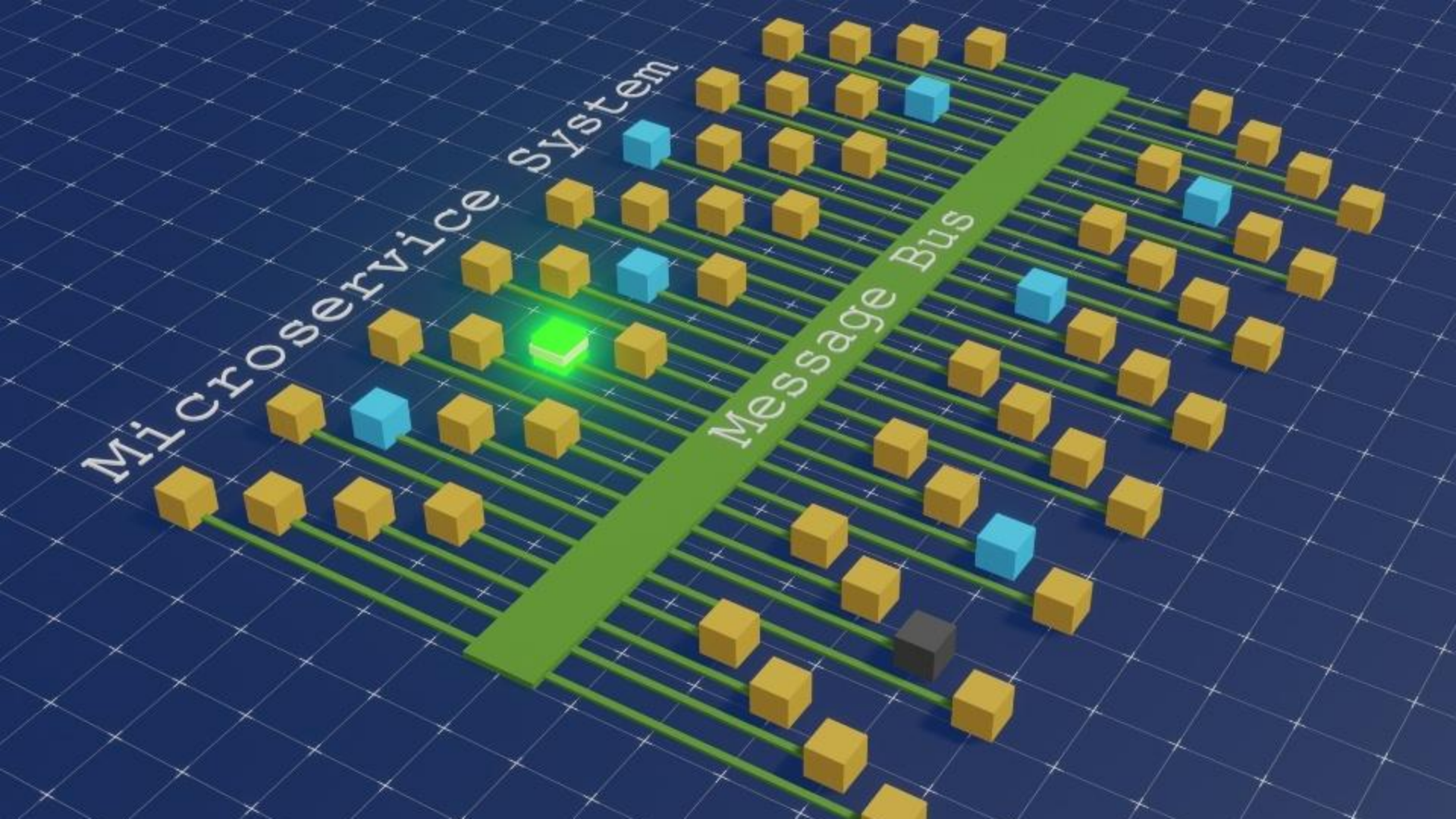
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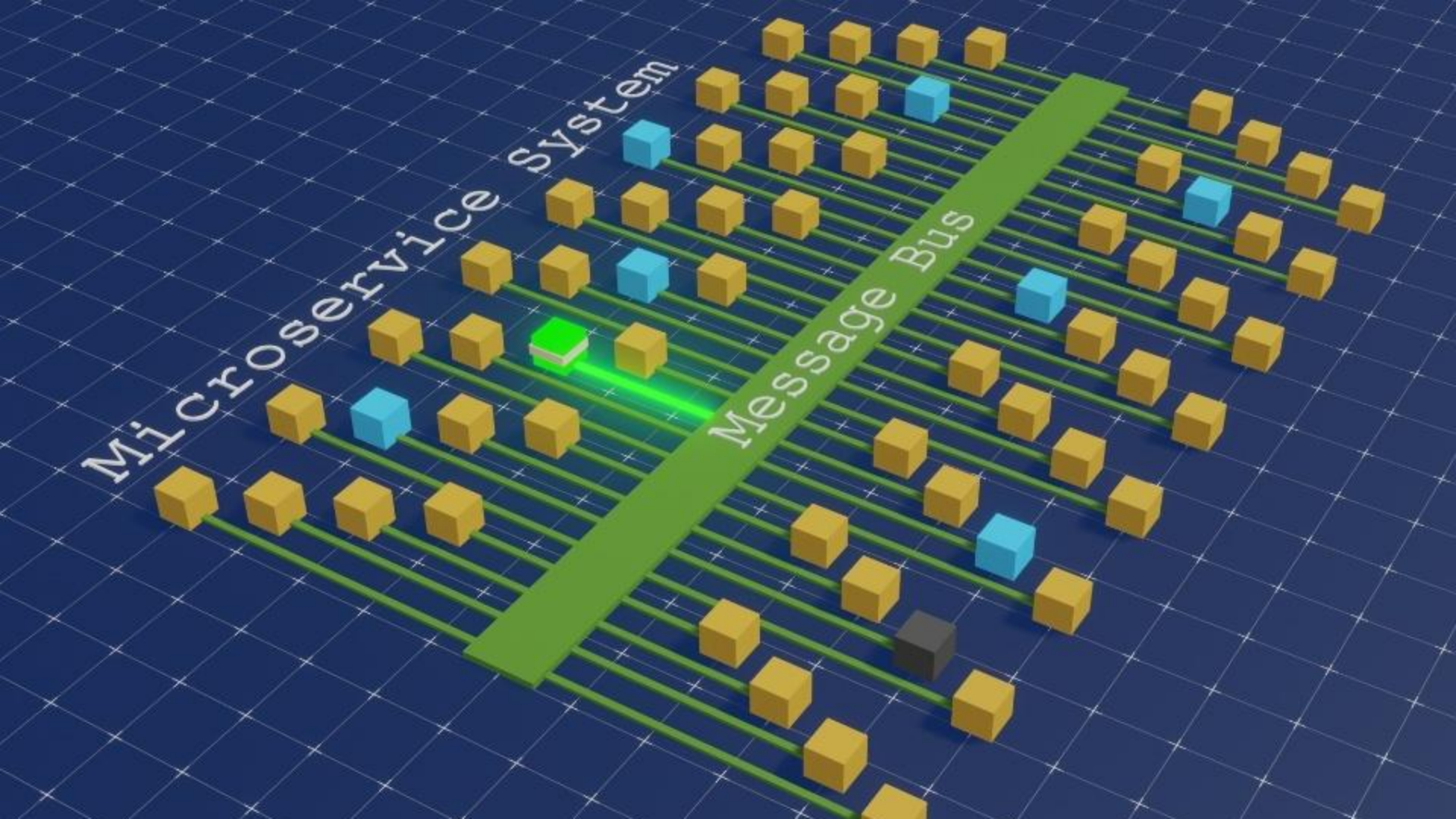
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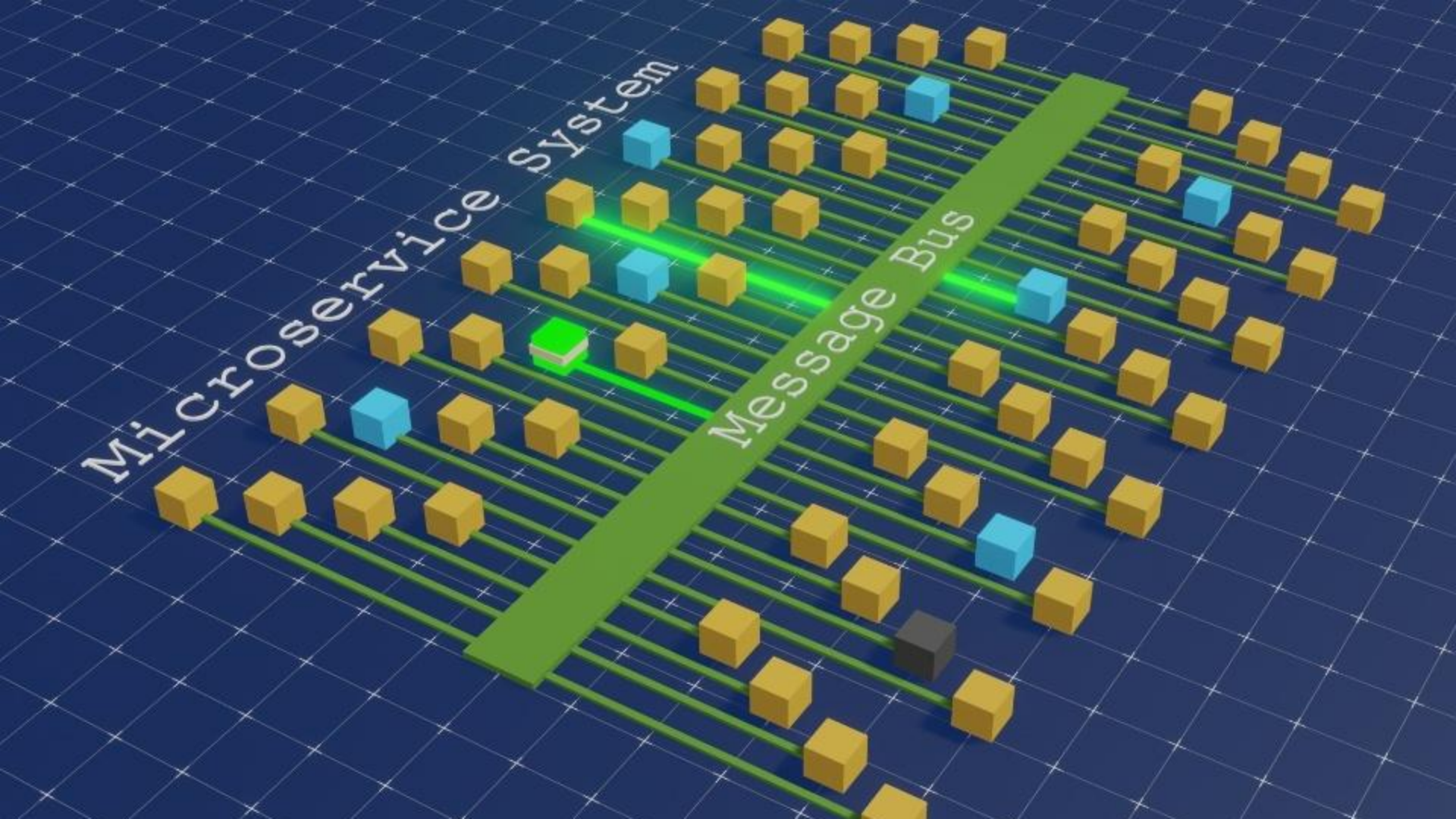
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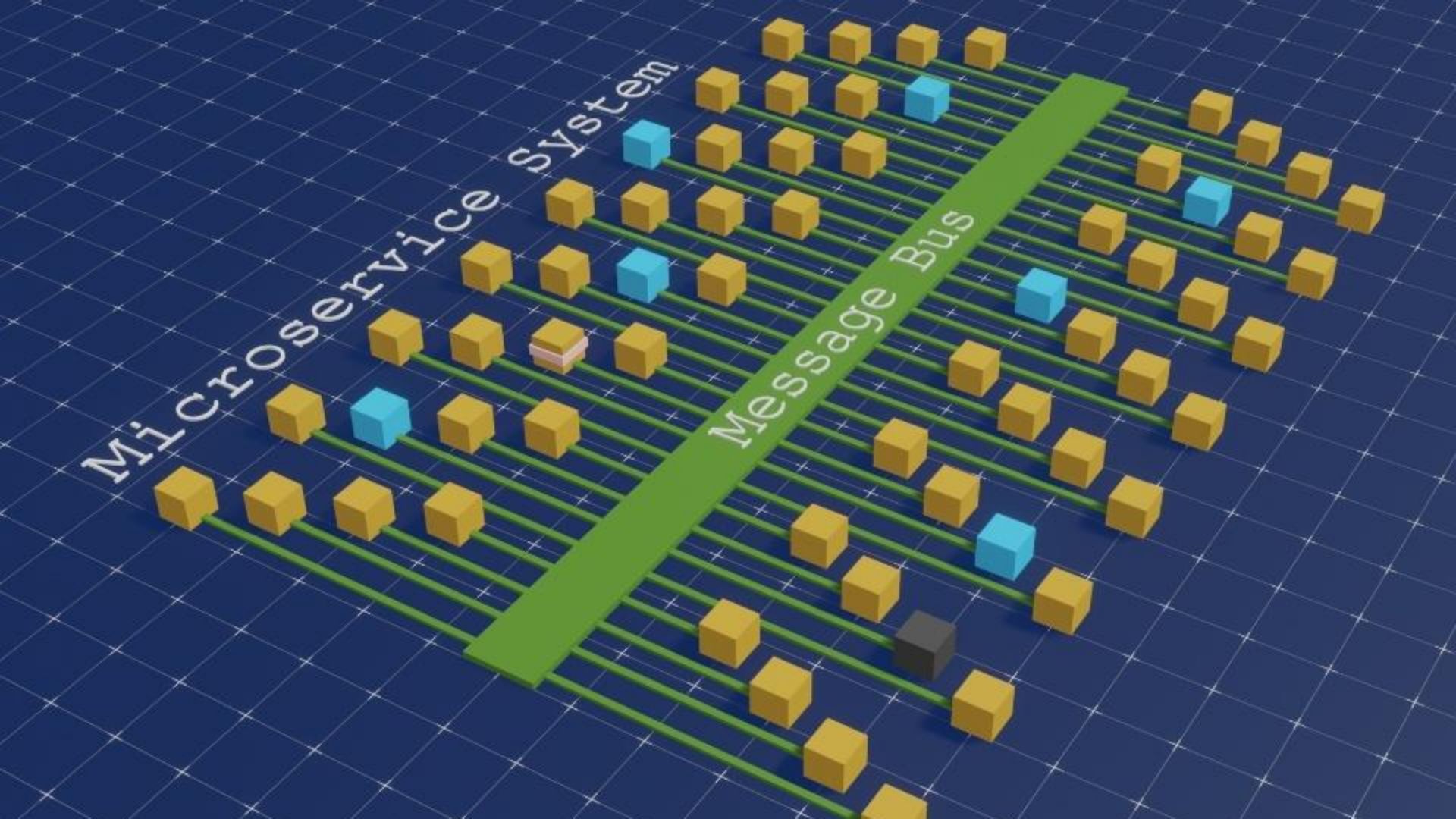
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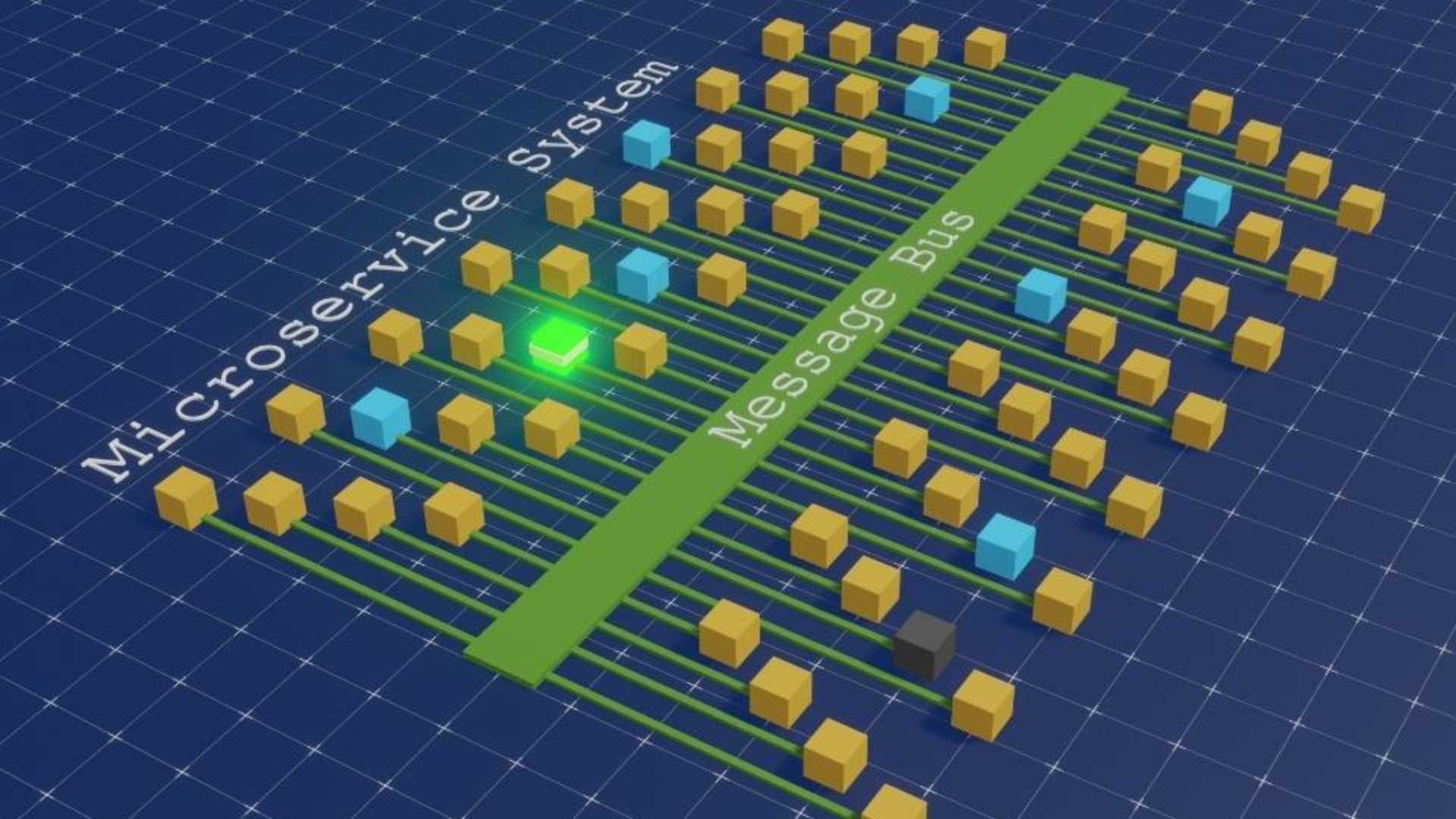
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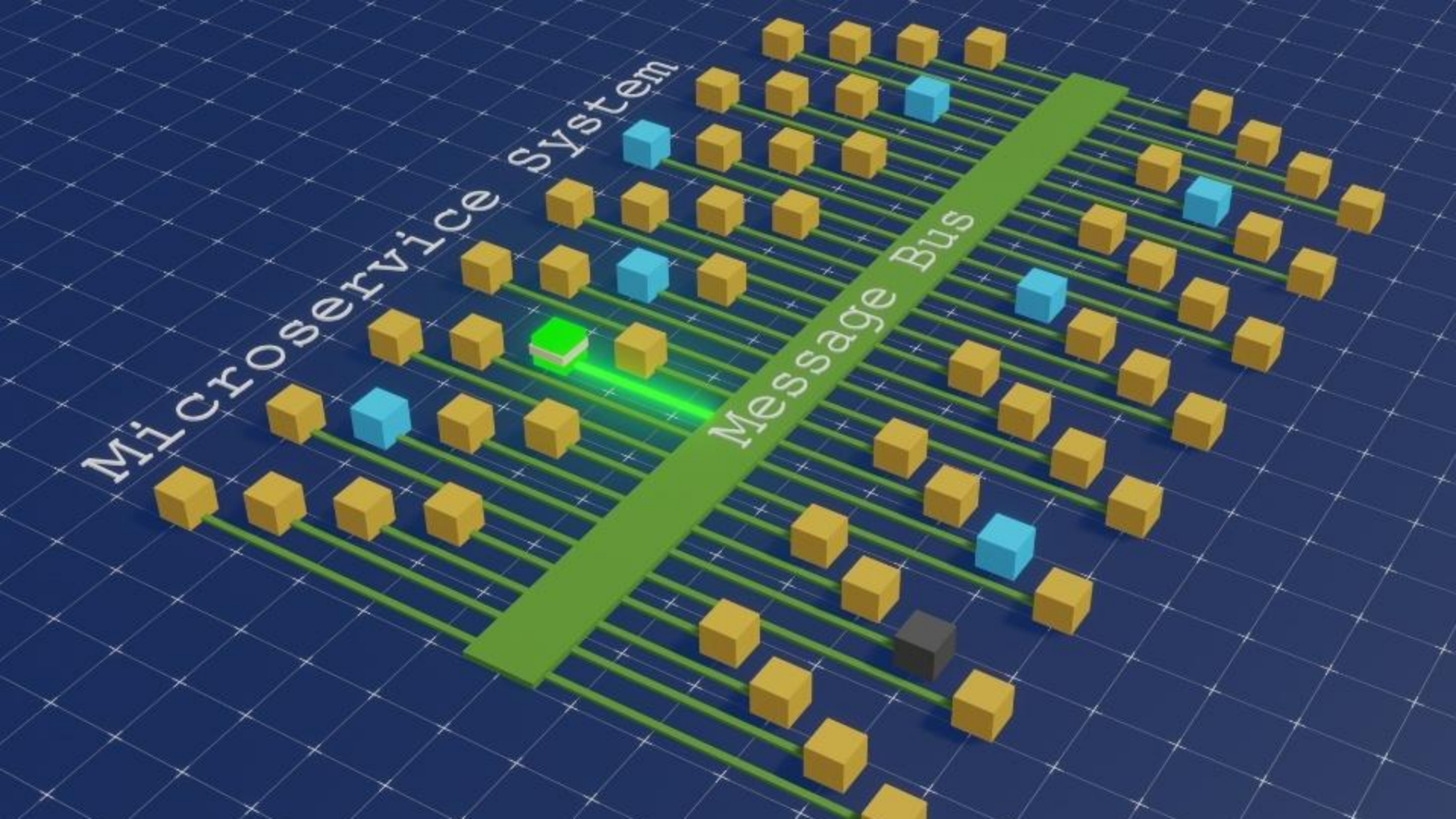
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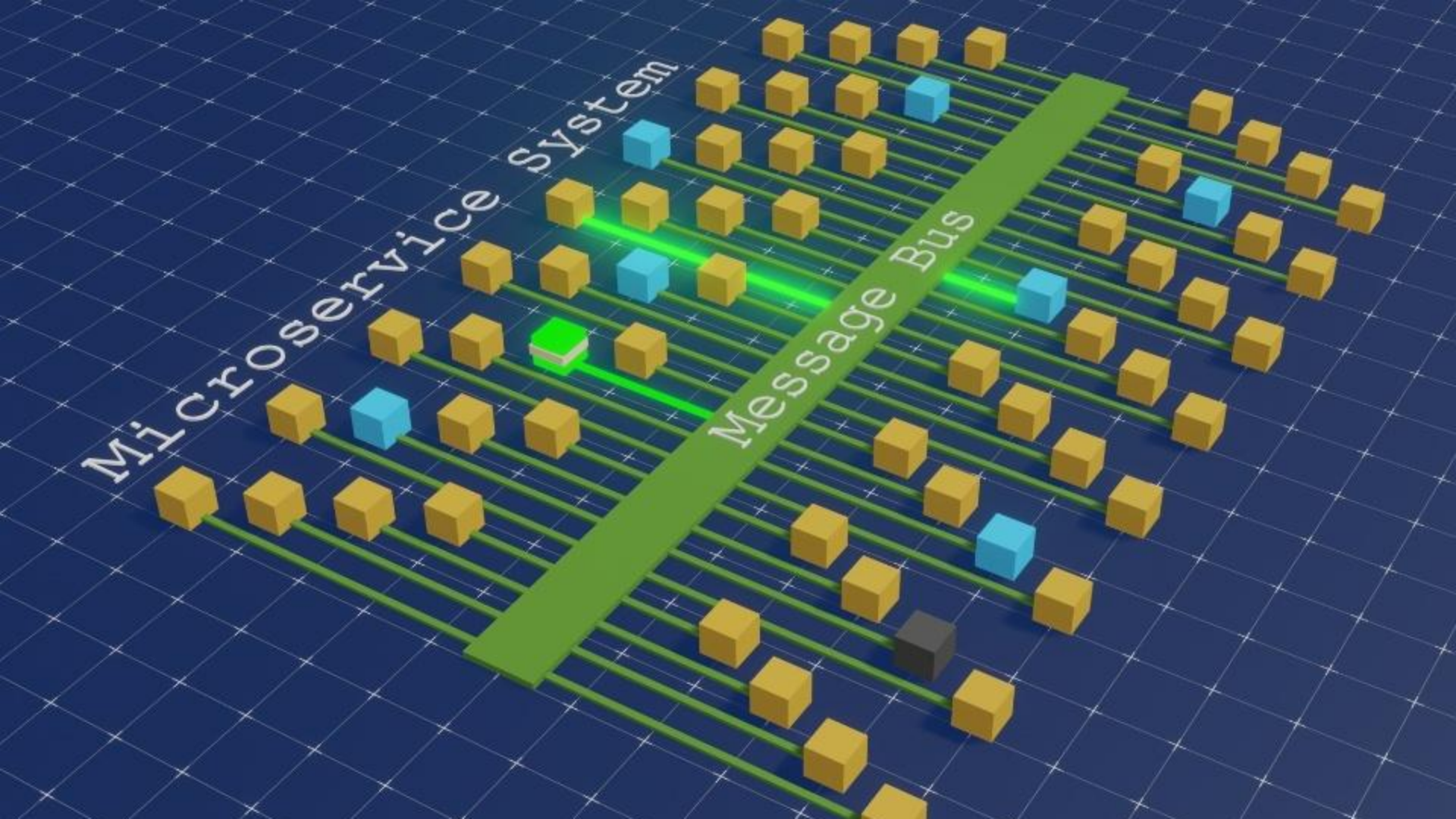
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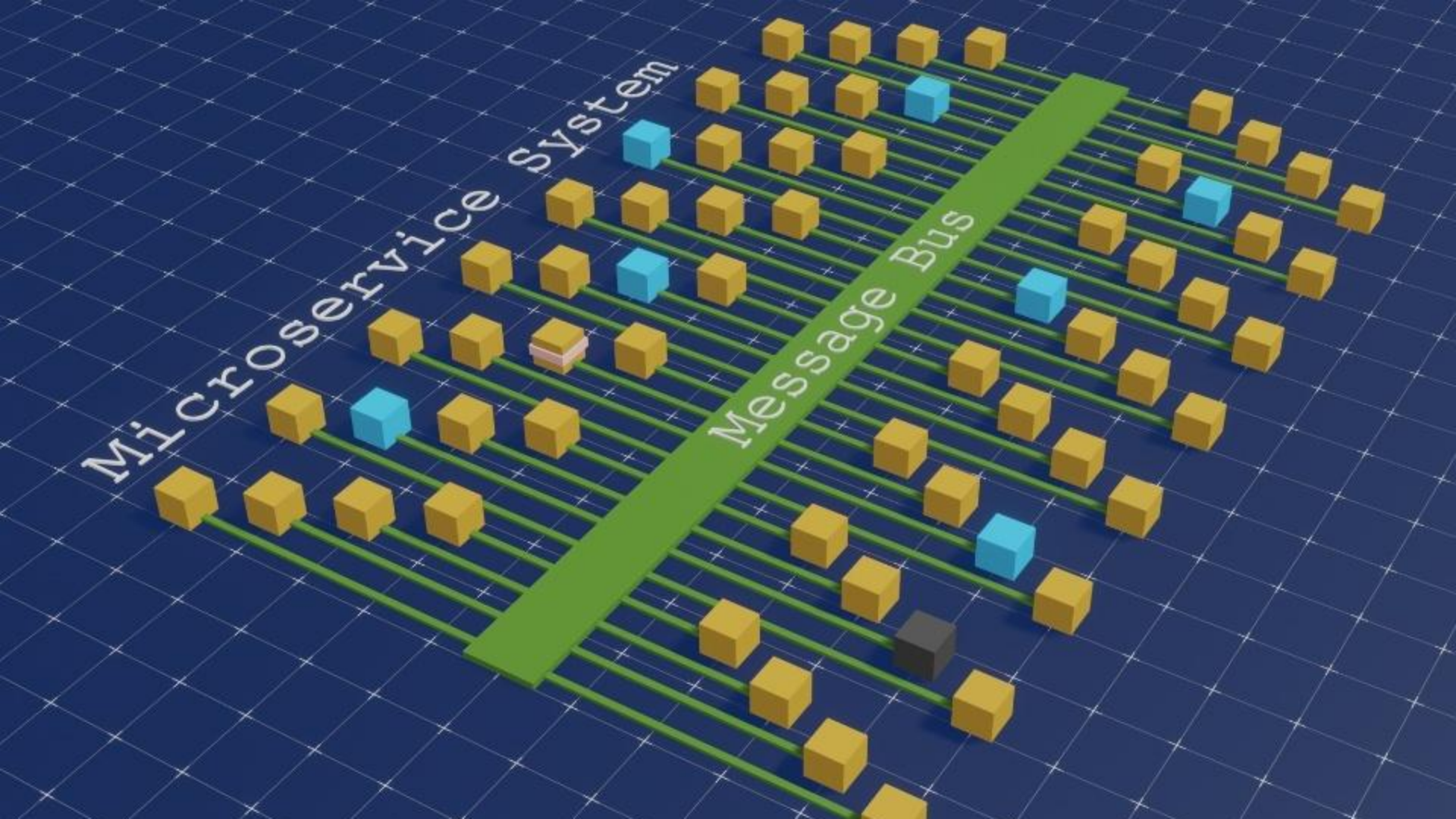
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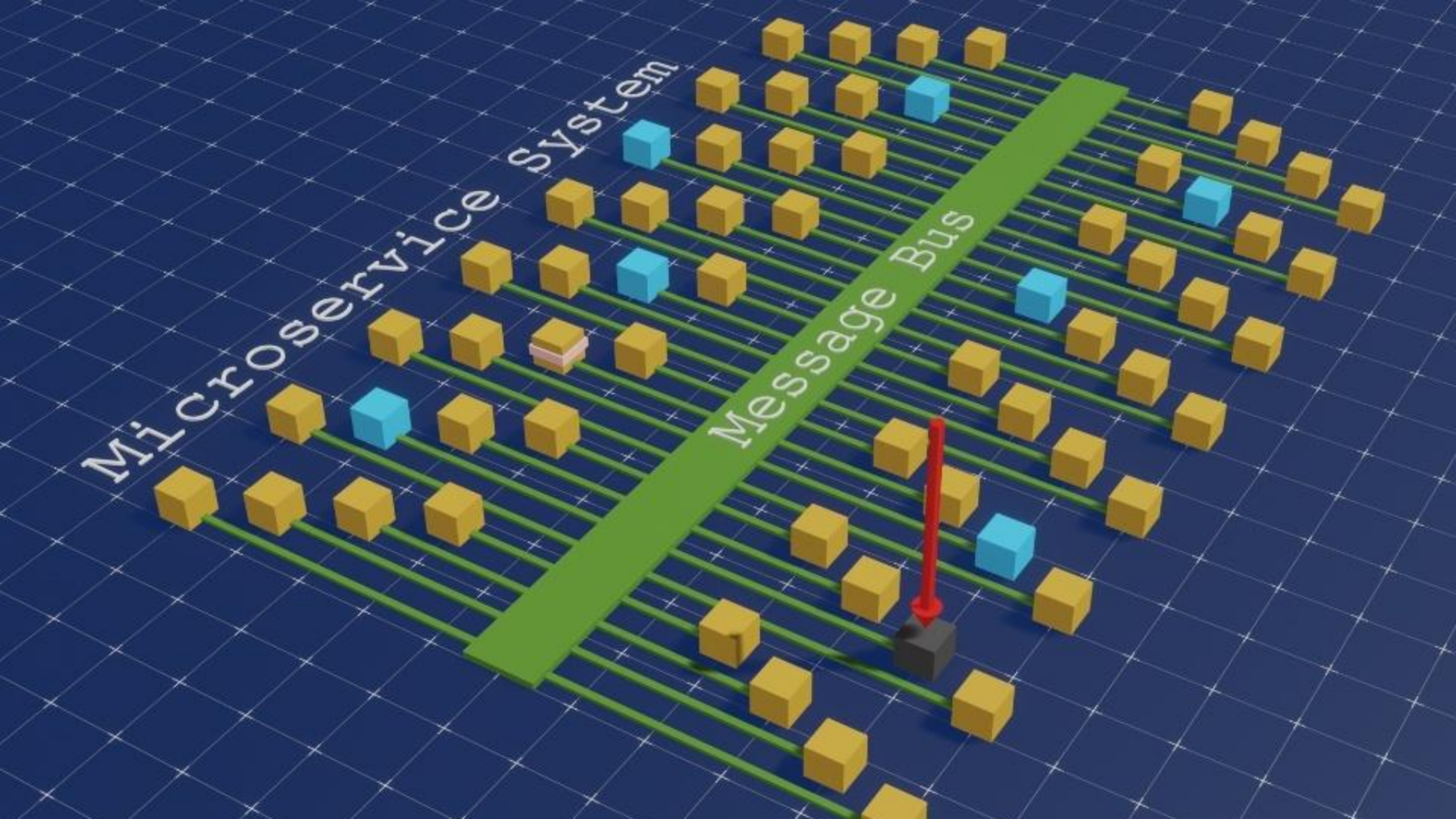
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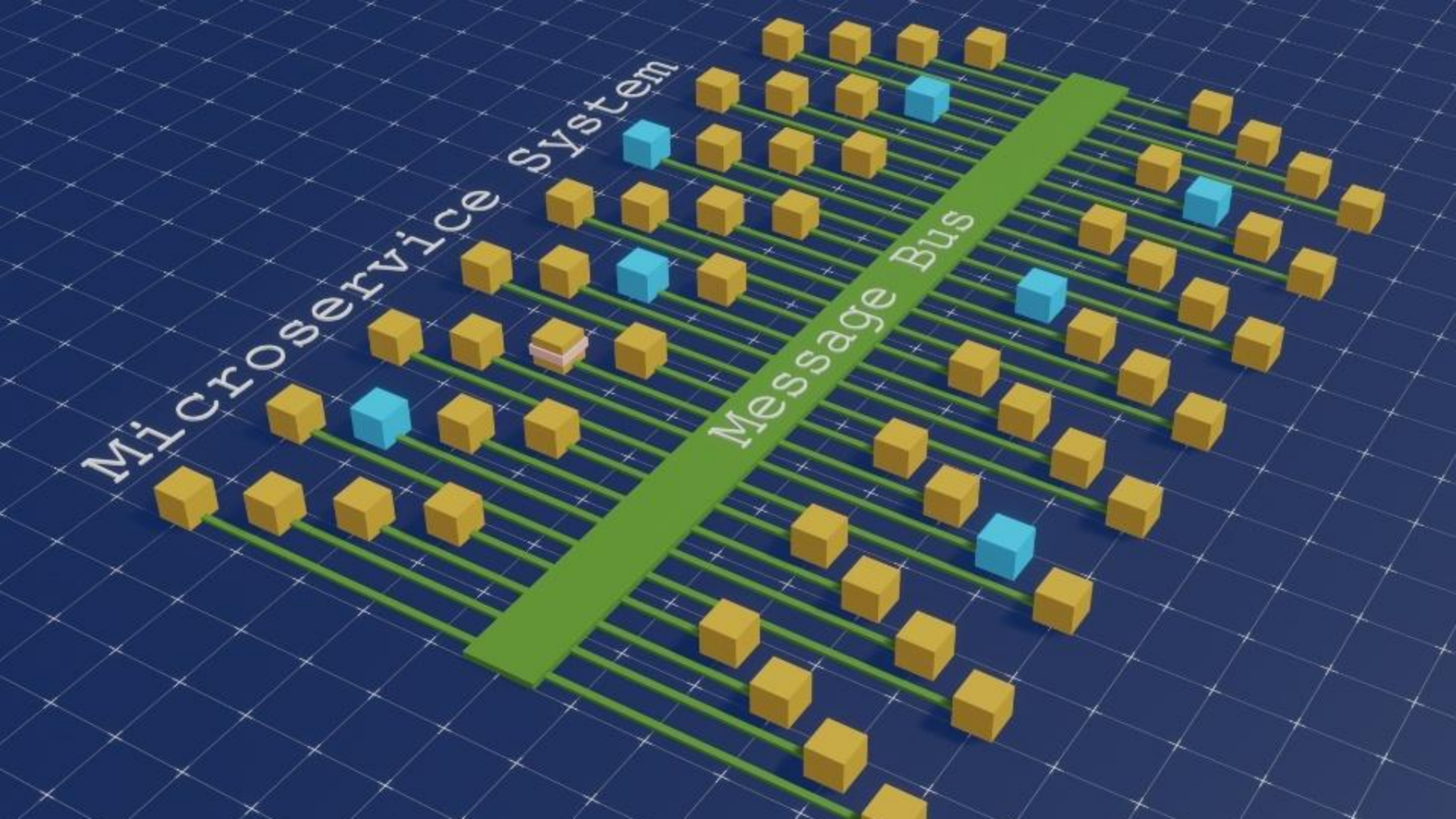
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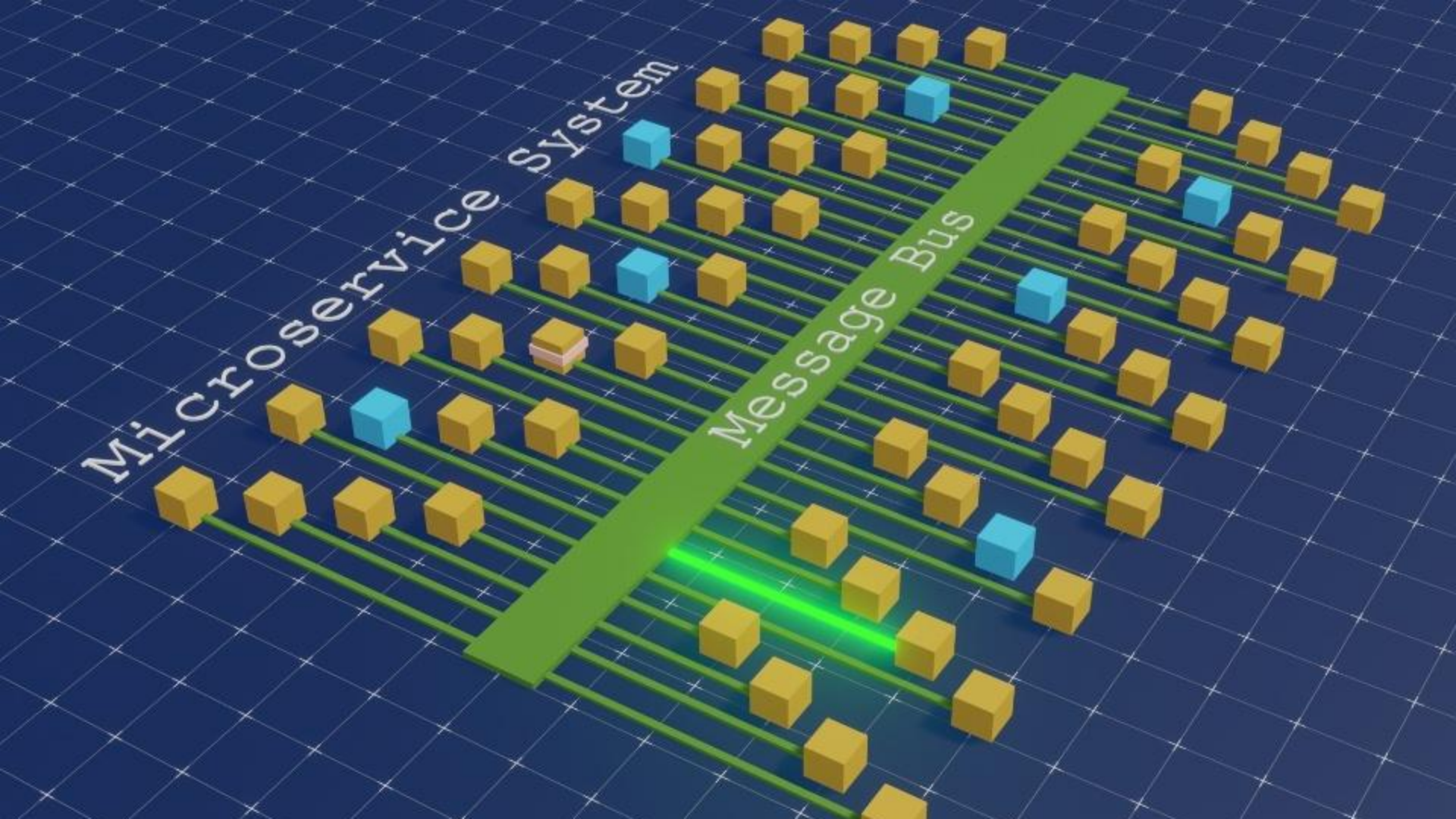
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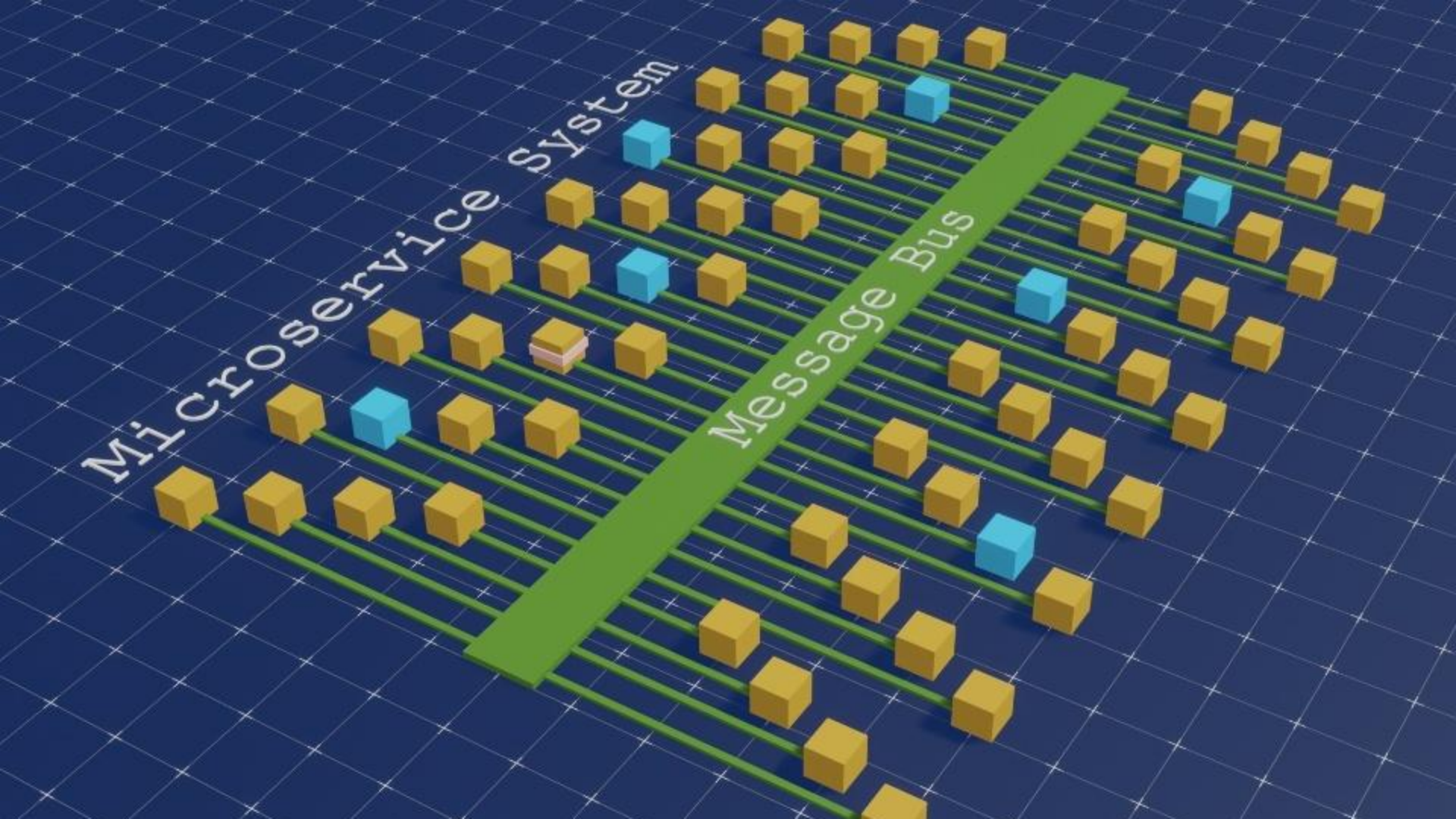
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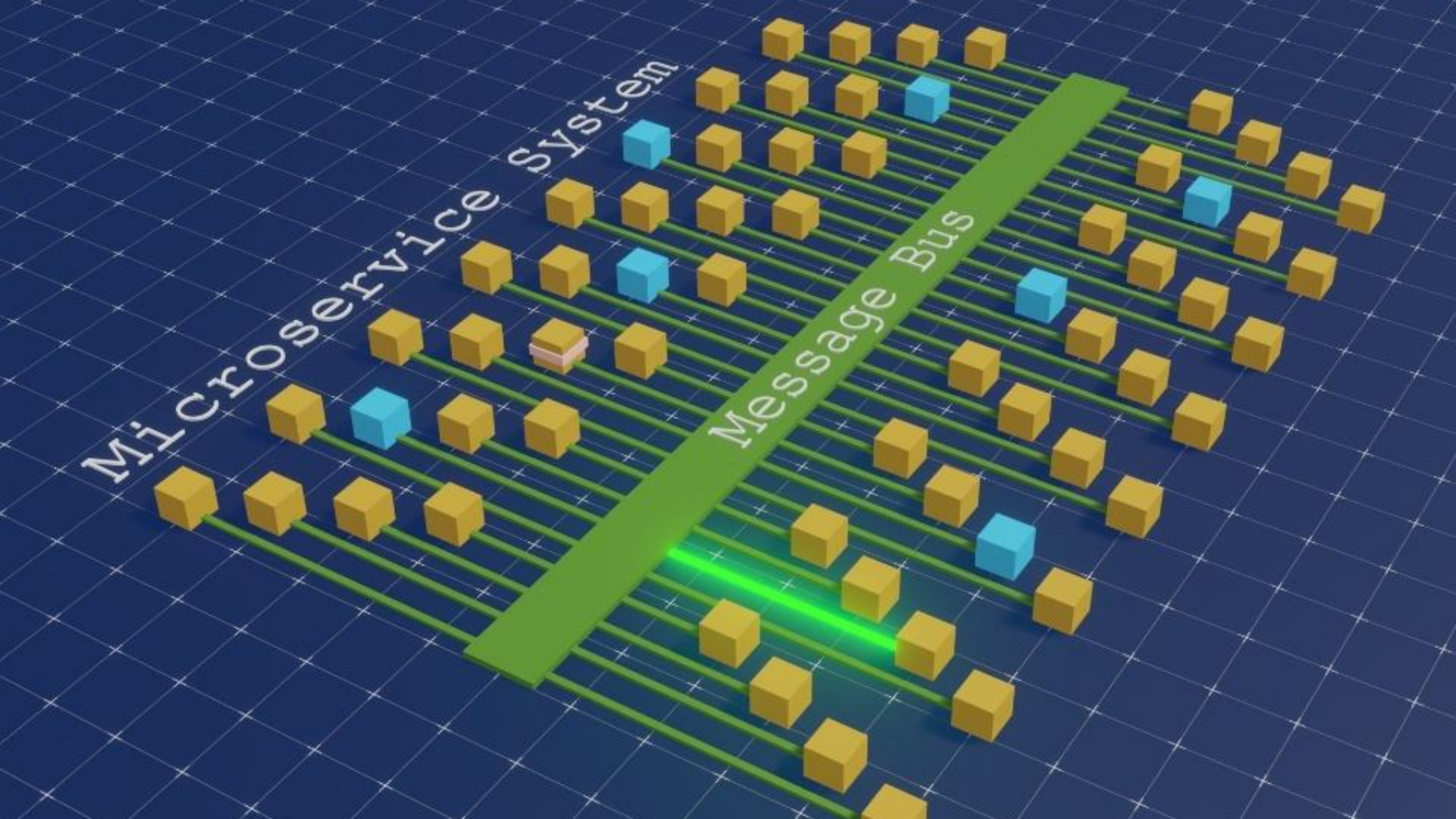
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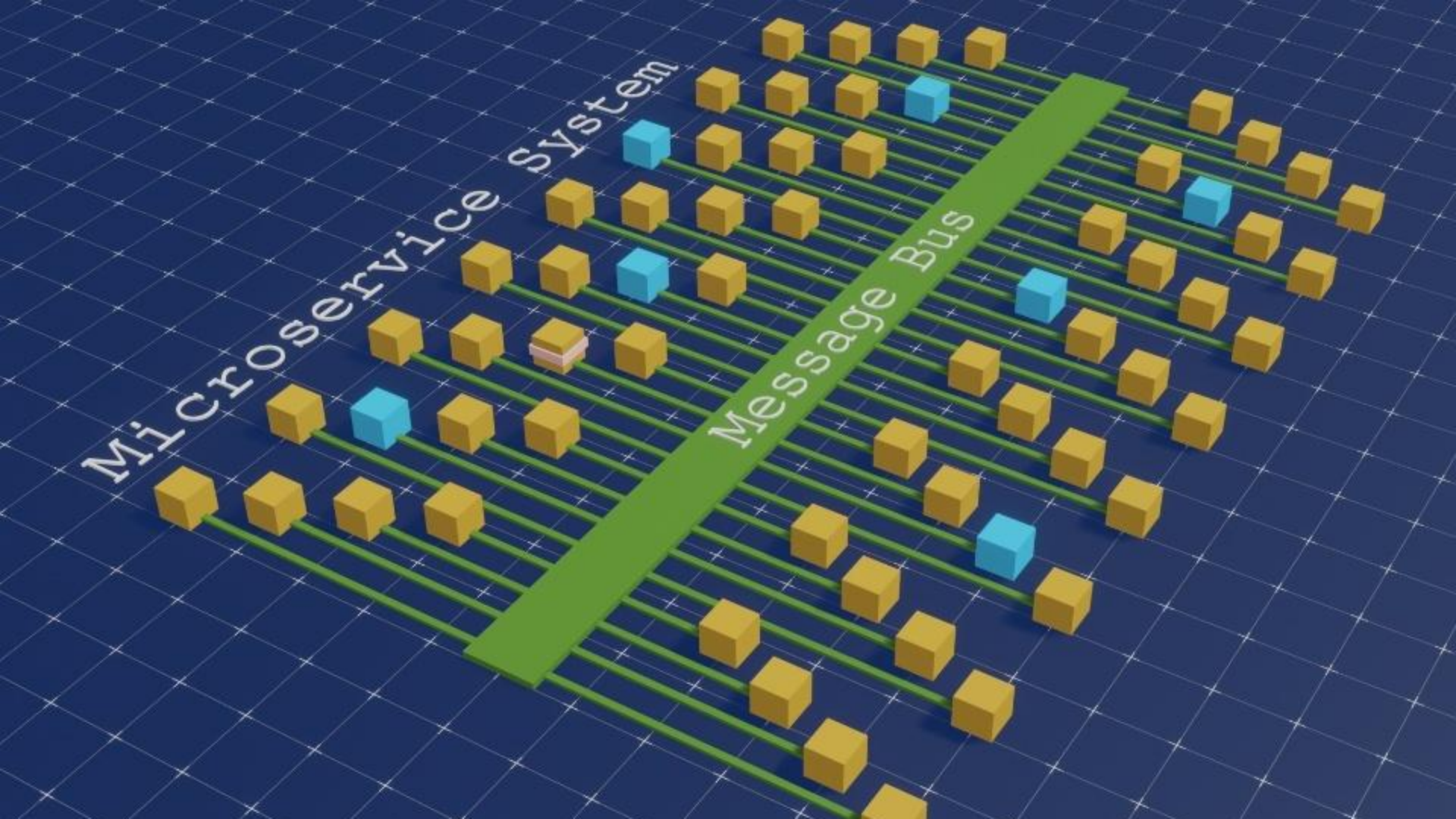
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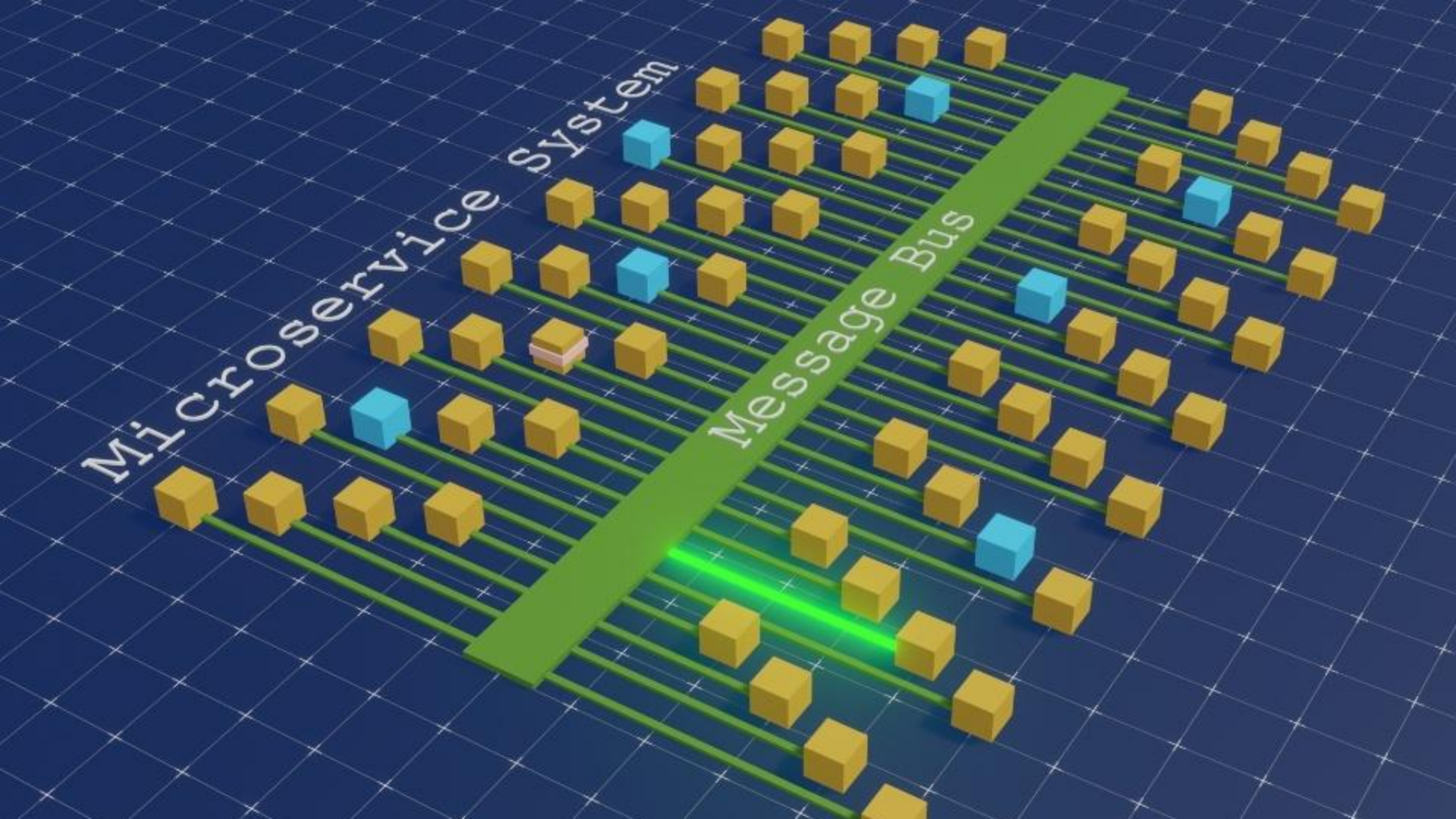
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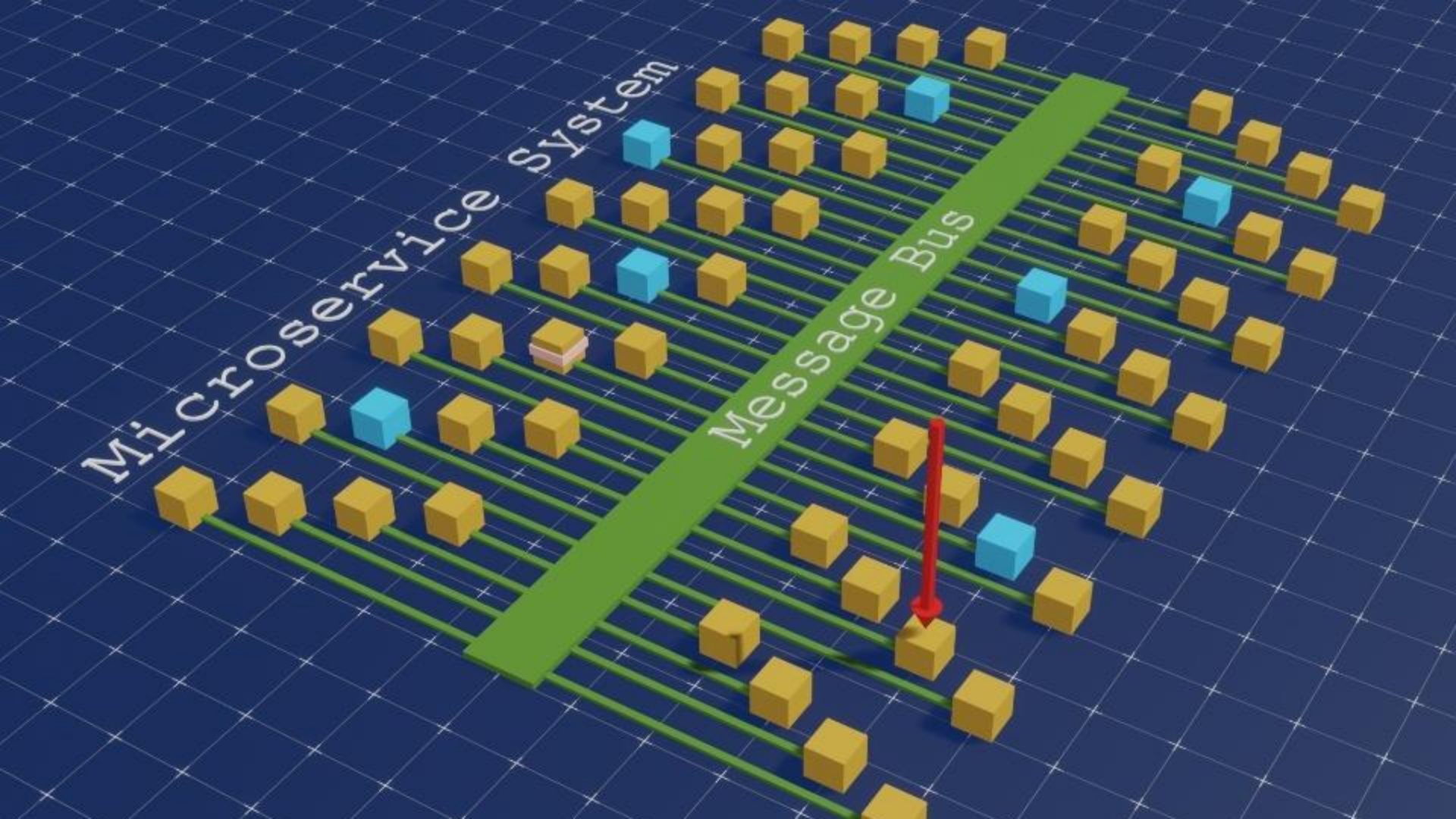
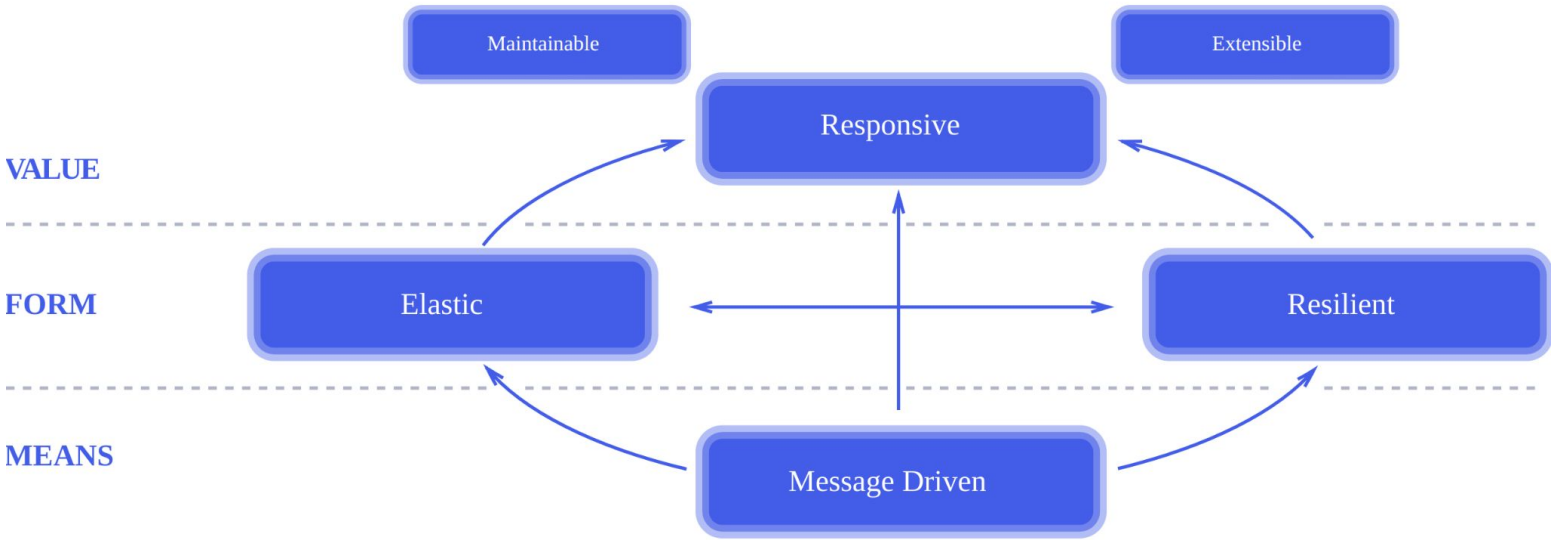

Microservice System
Message Bus

Advantages of Kafka's Communication Approach

- **Decoupled systems:** Easier maintenance and flexibility
- Asynchronous communication with robust delivery guarantees
- Standardized protocols enhance uniformity across systems
- Consumers manage their own data processing pace

The Reactive Manifesto



https://www.reactivemanifesto.org/

Event-Driven - Advantages

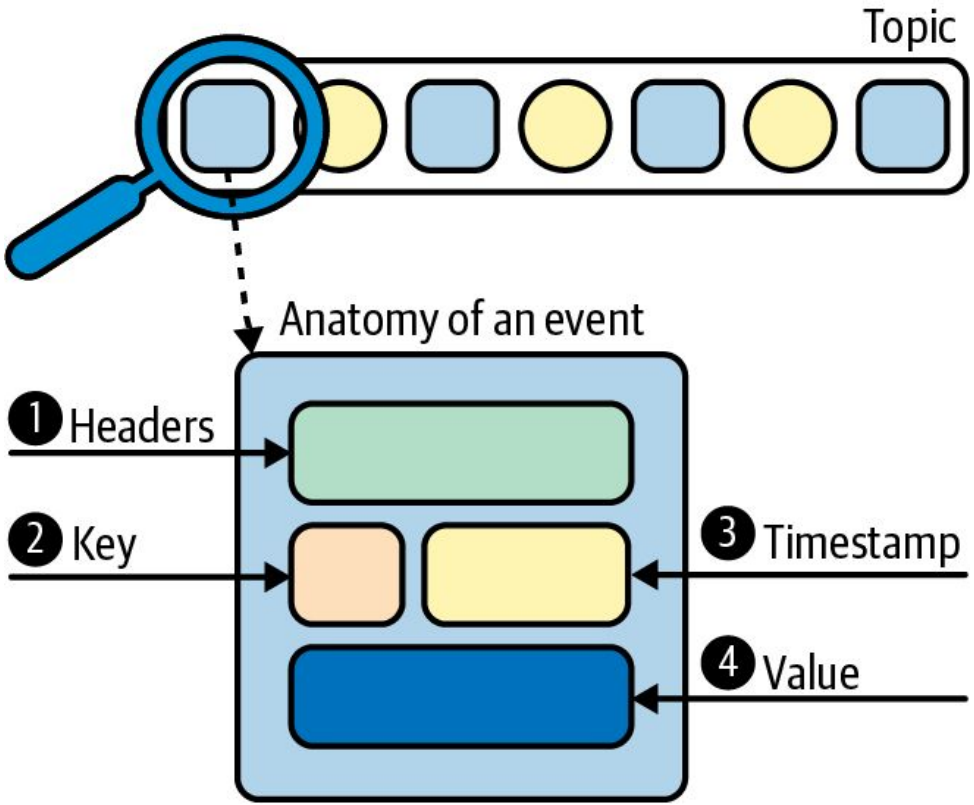
1. Decoupling of services
2. Scalability
3. Resilience and Fault Tolerance
4. Improved Responsiveness & Performance
5. Ease of Integration
6. Enables Reactive Programming Models

Event

Introduction to Data in Kafka Topics

- Kafka uses terms like messages, records, and events interchangeably.
- Preferred term in this context: Event.
- Definition of an event: A timestamped key-value pair that records an occurrence.

Anatomy of an Event in Kafka



Anatomy of an Event in Kafka

- **Application-level Headers:** Optional metadata, not commonly focused on in this text.
- **Keys**: Optional but vital for data distribution across partitions; help in correlating related records.
- **Timestamp**: Associates each event with the time of its occurrence; detailed exploration in later chapters.
- **Value**: Contains the event's actual data, stored as a byte array; requires deserialization by client applications.

Kafka Internal Arch

https://docs.google.com/presentation/d/1oZU7PEcszM1C1HmR7u7EI5-DhRiQJNKi/edit?usp=sharing&ouid=116008769779639876320&rtpof=true&sd=true