

System Design Series

Speaker

Pooja Gada

Speaker Intro

Pooja Gada

Current: Engineering Leader @
1Password

Previously: Slack, Digit, Qventus

Education: Carnegie Mellon
University

Motto: *Lift as we climb*

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Agenda

- Speaker Intro
- Who is this meetup for
- What is System Design
- Interview - Intro
- Let's design a unique ID generator

Who is this meetup for

- Preparing for interviews
 - Software Engineering
 - Engineering Management
 - Technical Product/Project Manager
- Build on System Design Skill set
 - Early in career
 - Expand knowledge on types of challenges
 - Learn how to build scalable systems

Why is System Design important

The Why...

Interviews

- One of the major indicator for leveling
- Interviewer wants to understand your way of thinking

Before we go further..

Some caveats / gotchas

Caveats...

- Most System Design Interviews require a bit of prep
 - You have 1 hour to impress the interviewer
 - Instagram / Youtube / Meetup - wasn't build in an hour - you kinda have to....
- There is no one-perfect-solution
 - There are many ways of designing a system - Leverage your background!

I want you go back to first principles...

Put on your curiosity hat...

- Think back on the time you decided to step into engineering
- What brings you joy
- You get to solve complex problems & expand on your understanding
- Stay optimistic
 - Before Interview
 - During Interview
 - You have the full power to change the course of the interview and make it successful
 - After Interview

System Design Interview Blueprint

- **Phase 1 - Understand & Define Scope**
 - Functional / Non-Functional Requirements
- **Phase 2 - Plan & Get Buy-in**
 - Focus of time
- **Phase 3 - Deep Dive**
 - Algorithms
 - System Design / Data Flow
 - Why / What / How - with hint of trade-offs
- **Phase 4 - Summarize**
 - Wrap-up

Nuf Said. Let's build
something!

Problem

Design a system to generate Unique ID's

Stop...

Do not jump into problem solving right away...

Let's look back at the blueprint...

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Phase 1 - Understand & Define Scope

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What clarifying questions would you ask the interviewer... Type in zoom chat...

What are the properties of the unique IDs? What do they look like? **Unique, integer only, sortable**

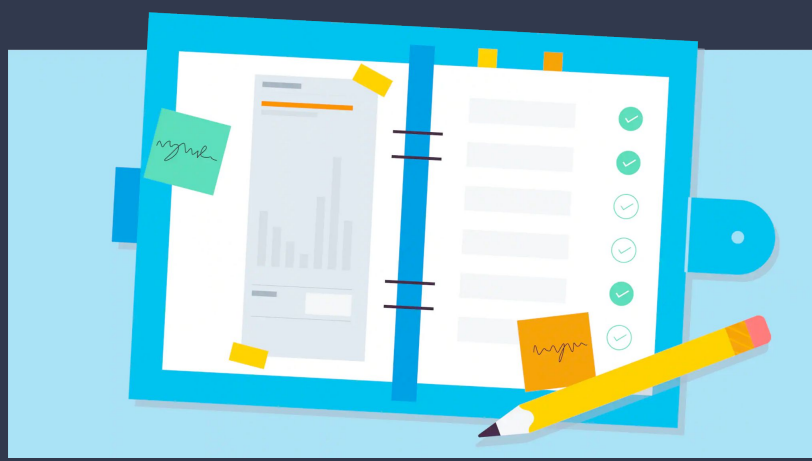
Any length requirement? **64 bit**

What are potential use cases? Where will this system be used? **IDs for posts, likes, comments for our social media app**

What is the scale of the system we are designing for? **100 million IDs generated total, 10k/s**

Outline & Summarize the Scope

So we will be designing a system to generate unique IDs. Where IDs are unique, numerical only, can be ordered, and can fit into 64 bit. We expect this system to be scalable and reliable - as we need to generate 10000 unique IDs per second.



Phase2 -Plan & Get Buy-in

There are so many ways to do this! Let's dive into them...

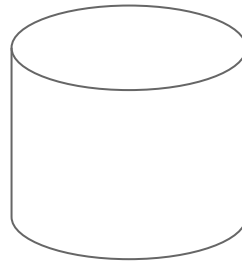
Database Increment Operator

The Good:

- Database is responsible for the unique ID
- Is sortable
- Is numeric only

The Not-So-Good:

- Alas not scalable
- Single point of failure(SPOF)



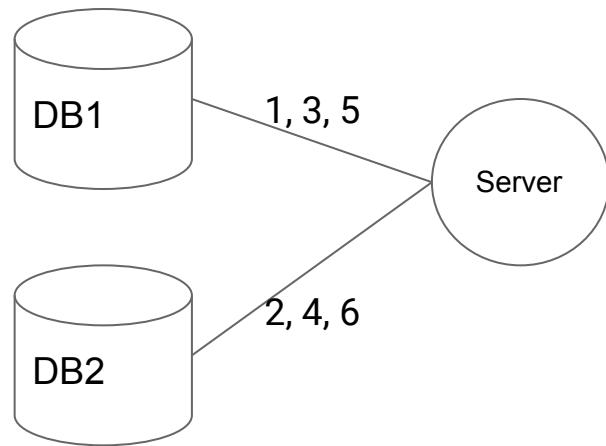
Multi-Master replication

The Good:

- Database is responsible for the unique ID
- Is numeric only
- No SPOF

The Not-So-Good:

- Not really scalable
 - Adding/Removing servers not easy
- IDs not kinda-sorta sortable



A more distributed Unique ID generator

- Divide and conquer the generation

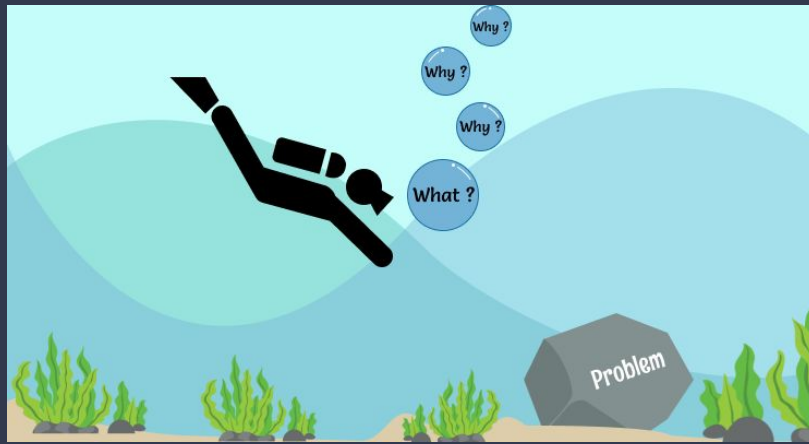
Timestamp	Server ID	Sequence Number
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Timestamp - Gives us some sorta sortability

Server ID - Use a Zookeeper

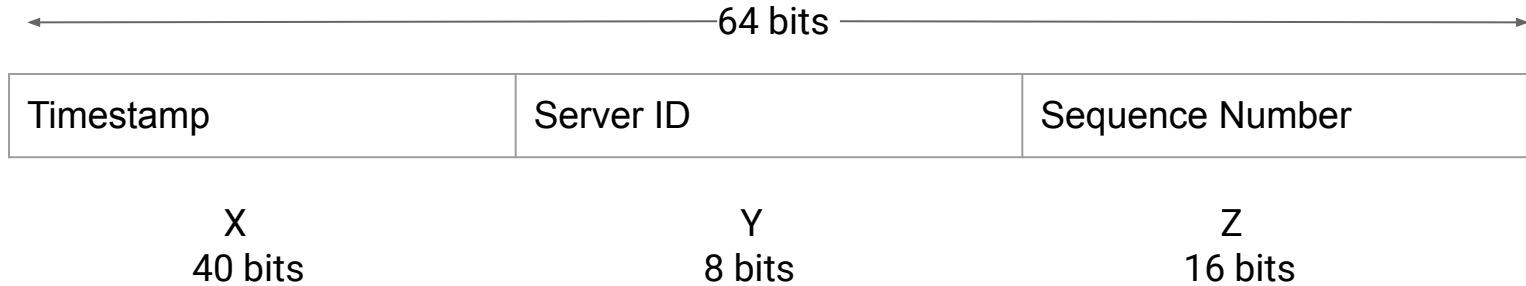
Sequence number - Generated by the server

Aha... this seems like a potential solution...Tell me more...



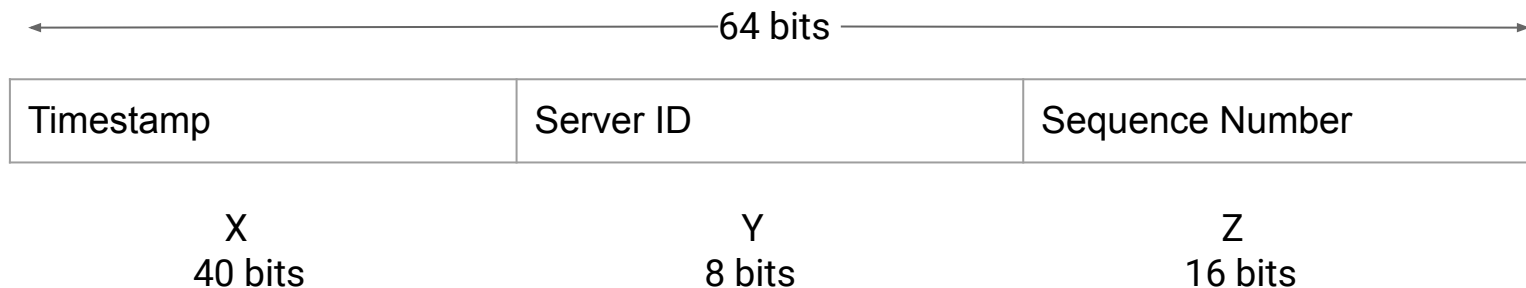
Phase3 - Deep Dive

Deep Dive – IDs



- Can also add few bits of data center ID
- Can also add few bits of thread ID

Deep Dive – IDs

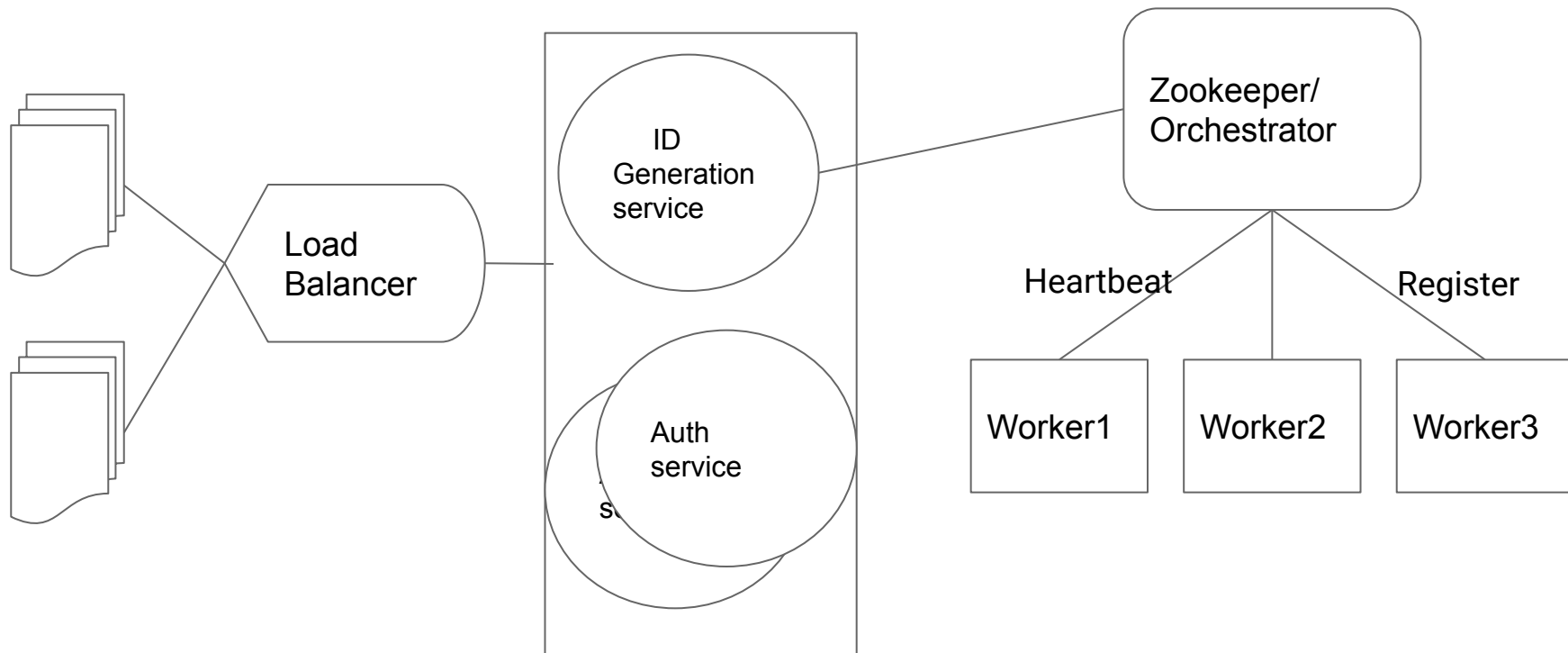


- ~34 years no name collision
- 256 servers
- 65536 unique sequence every millisecond

June 14, 2023 5:54pm PST - 1000803930 ms

June 14, 2023 5:55pm PST 1000809930 + 100 + 100900

High Level System Design





Phase 4 - Summarize & Wrap-up

Resources

- System Design Interview Volume 1 & 2
 - Alex Xu & Sahn Lam
- Educative.io
- Tryexponent
- [Flickr ticket server](#)
- [Twitter's Snowflake](#)

Next sessions

- Payments processing
- News Feed System
- Notification System
- Guest Speakers - TBD

What would you like to learn more?

