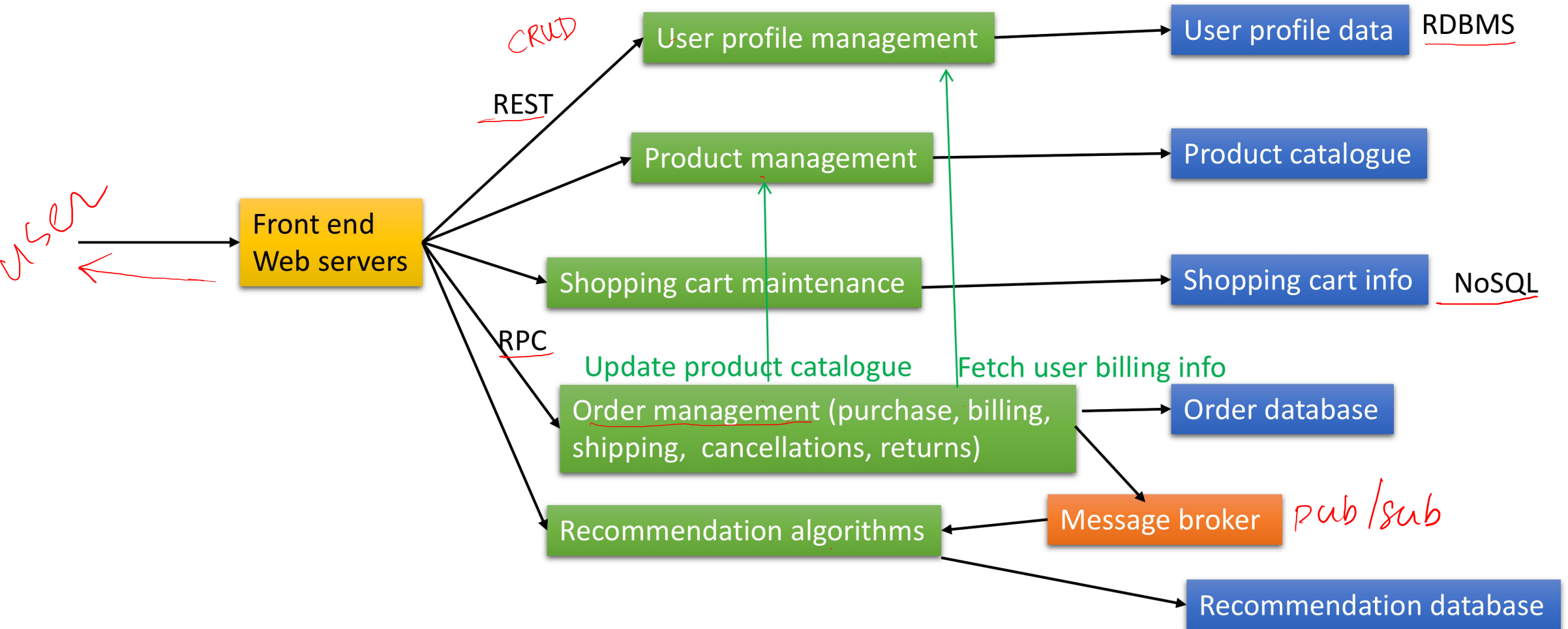# Design and Engineering of Computer Systems

Lecture 29:
Examples of end-to-end systems design

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Recap: e-commerce system design

Video streaming: requirements

- Consider a simple video streaming system that lets users stream videos, and also create content. What functionality do we expect?

- Users should be able to upload content, which is made available in multiple resolutions and formats.

- Users should be able to download/stream content

- The system should recommend videos to watch based on history of which videos user click and watch

- Other services: store users profile information, authentication, billing for paid services, ..

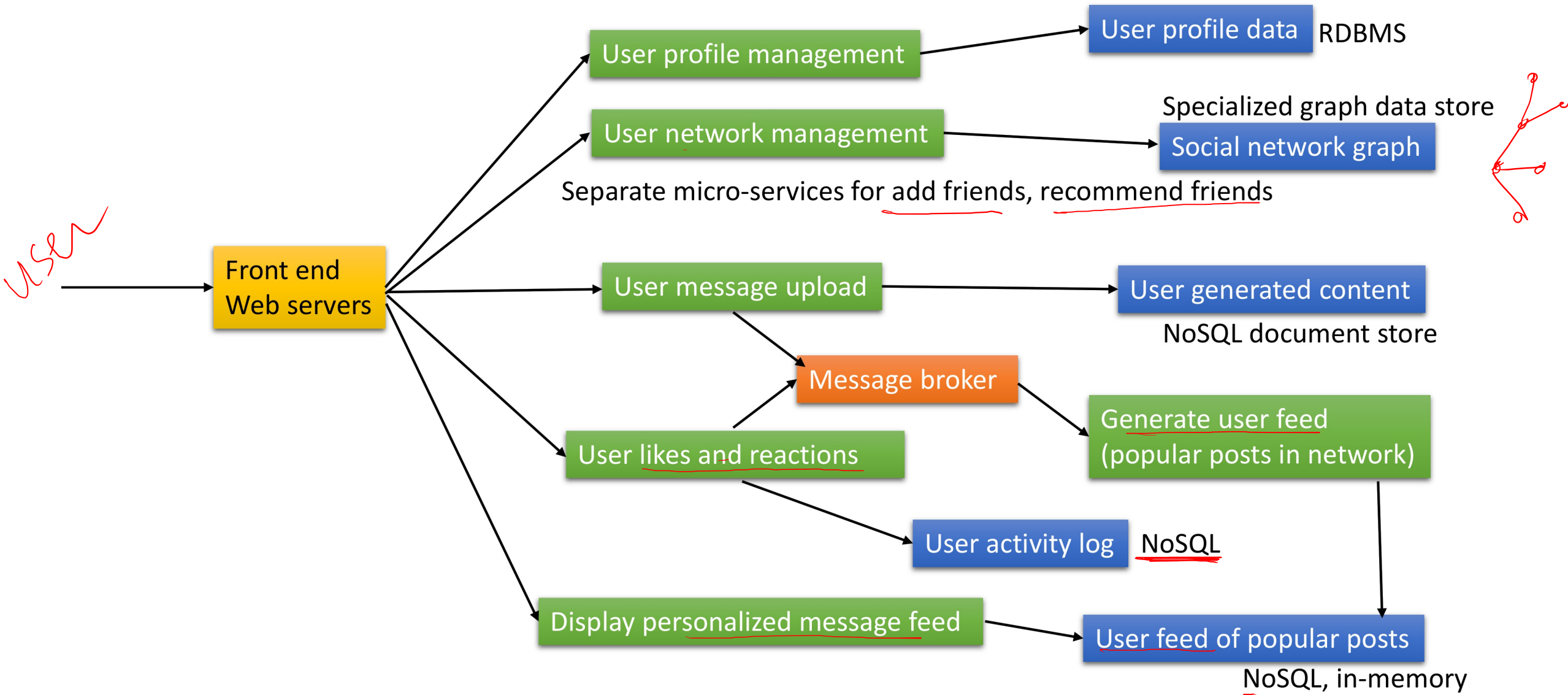- All these functions provided by multiple components, each having multiple micro-services

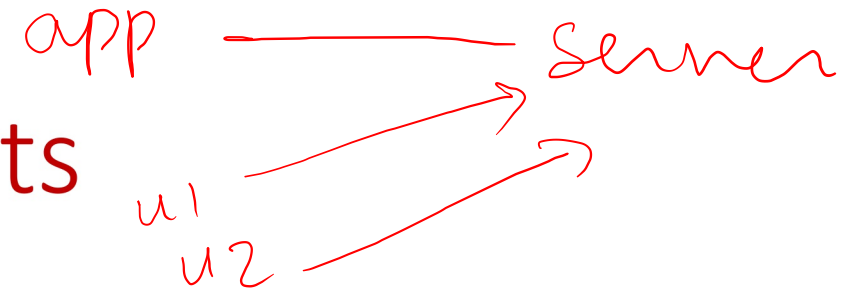# Video streaming system: example architecture
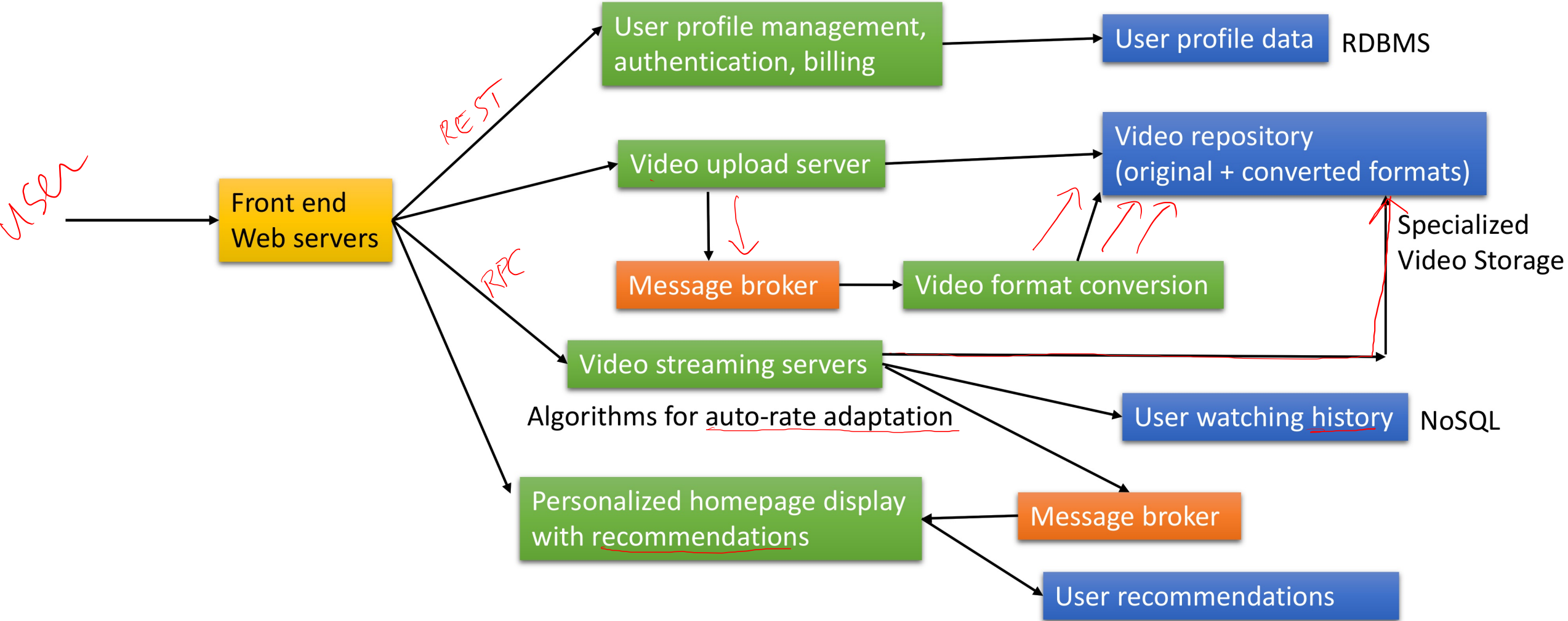
Social networking: requirements

- Social networking systems are hugely popular today, and handle large number of users exchanging huge volumes of data

- Users join a service, make friends, form a network

- Social network recommends more friends to add based on connections of existing friends

- Users post messages, which are disseminated within the user's network

- Users see popular content posted by friends, and react to it

Social networking: example architecture

User →

Front end Web servers

- User profile management → User profile data — RDBMS
- User network management → Social network graph

Specialized graph data store

Separate micro-services for add friends, recommend friends

- User message upload → User generated content

NoSQL document store

- Message broker
- User likes and reactions → Message broker
- Generate user feed (popular posts in network)
- User activity log — NoSQL
- Display personalized message feed → User feed of popular posts

NoSQL, in-memory

Instant messaging: requirements

- Users connect to server via persistent connections from mobile apps
- If two users are online and wish to communicate, messages exchanged between such users are delivered via the messaging service immediately
- If the recipient of a message is offline, the service buffers messages for later delivery. User's client checks for such messages periodically.
- Users form groups of other users and post messages in groups, which are broadcast to all the users in the group.

Instant messaging: example architecture
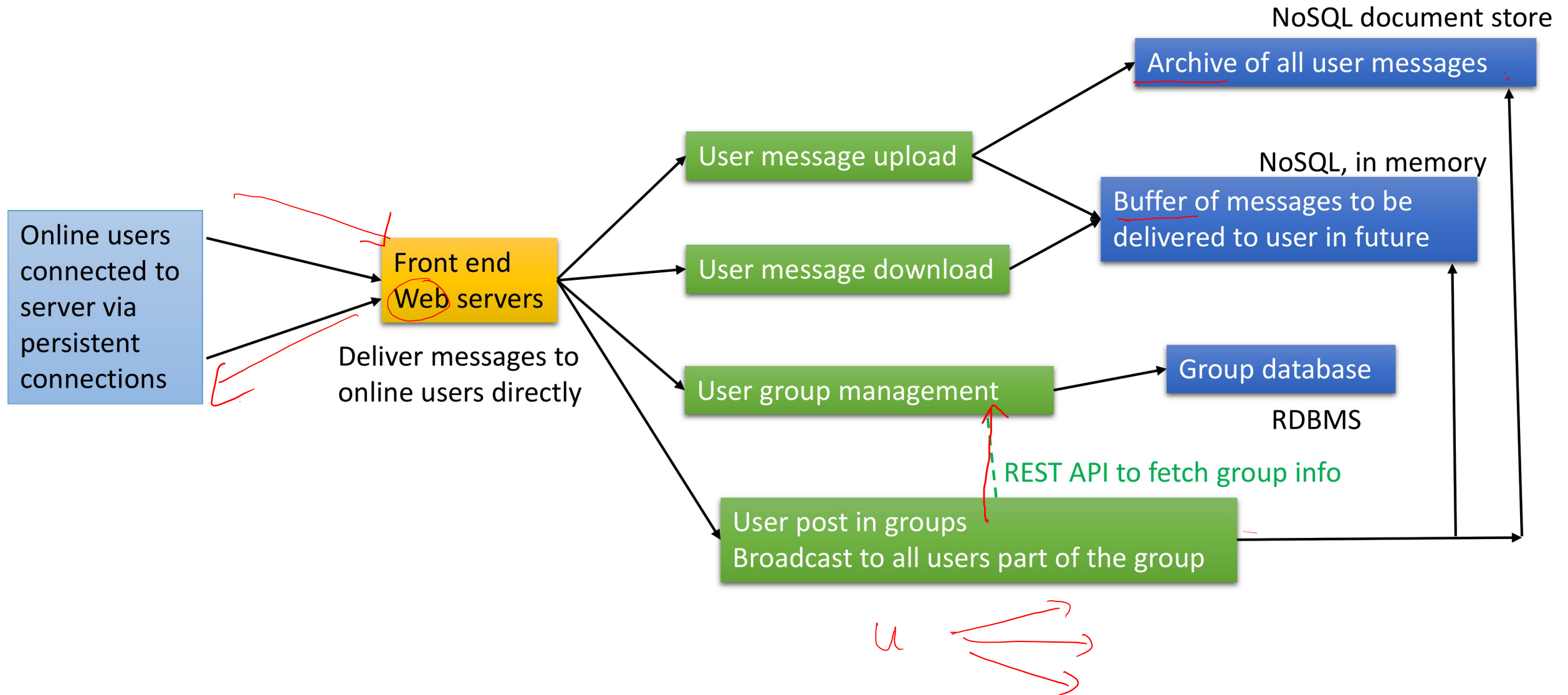
Summary

- In this lecture
  - Systems design examples
- Look at designing more such simple systems on your own. Think of how you will make the systems more realistic by adding more complex features.