

Architecture Katas Online



ThoughtWorks®

NEAL FORD

Director / Software Architect / Meme Wrangler



<http://nealford.com>

Where did this
idea come from?

The screenshot shows a web browser window with the URL `archkatas.herokuapp.com` in the address bar. The page title is "Architectural Katas". The main content features two quotes:

"How do we get great designers? Great designers design, of course." --Fred Brooks

"So how are we supposed to get great architects, if they only get the chance to architect fewer than a half-dozen times in their career?"
--Ted Neward

A blue button labeled "Do one! »" is visible. Below the main content, there are six sections with links:

- About**: "The Architectural Katas started as a presentation workshop by Ted Neward. They've taken on a life of their own." [Learn more »](#)
- Invite**: "Want an experienced Architectural Kata moderator to run the workshop at your place of business?" [Contact »](#)
- Rules**: "Doing an Architectural Kata requires you to obey a few rules in order to get the maximum out of the activity." [Read rules »](#)
- Lead**: "Want to run the Architectural Katas yourself? There's only a few things you need to know before you do." [Learn how »](#)
- Contribute**: "New Kata problems/proposals are always welcome." [Send ideas »](#)
- Join**: "Want to find a group near you that's running the Architectural Katas?" [Find groups »](#)

At the bottom left, a copyright notice reads: © Neward & Associates 2012.

...and then...

The screenshot shows a web browser window with the URL "fundamentalsofsoftwarearchitecture.com" in the address bar. The page content includes a header with navigation links like "Architectural Katas", "Fundamentals of Software Architecture", and "List of Architecture Katas". Below the header is a section titled "Architectural Katas" with a sub-note "inspired by Ted Neward's original [Architectural Katas](#)". A quote by Fred Brooks is displayed: "How do we get great designers? Great designers design, of course." followed by "Fred Brooks". Another quote by Ted Neward follows: "So how are we supposed to get great architects, if they only get the chance to architect fewer than a half-dozen times in their career?" followed by "Ted Neward".

fundamentalsofsoftwarearchitecture.com

Architectural Katas Updated Fundamentals of Software Architecture Images Architectural
Katas Fundamentals of Software Architecture List of Architecture Katas

Architectural Katas

inspired by Ted Neward's original [Architectural Katas](#)

"How do we get great designers?
Great designers design,
of course."
Fred Brooks

"So how are we supposed to get great architects, if
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About

Architectural Katas are intended as a small-group (3-5 people) exercise, usually as part of a larger group (4-10 groups are ideal), each of whom is doing a different kata. A Moderator keeps track of time, assigns Katas (or allows this website to choose one randomly), and acts as the facilitator for the exercise.

Each group is given a project (in many ways, an RFP—Request For Proposal) that needs development. The project team meets for a while, discovers requirements that aren't in the original proposal by

<http://fundamentalsofsoftwarearchitecture.com/katas/>

...and then...



Late $2^{2^2} \dots$

LIVE ONLINE TRAINING

Architectural Katas

Topic: Software Development



NEAL FORD



October 20, November 17 & December 3, 2020
10:00am – 12:00pm EST

This course has ended.

What you'll learn Instructor Schedule

New information after 10/20 kickoff:

- To be considered for participation in Architectural Katas, you must complete the [Google form](#) by midnight Eastern time on 10/22.
- Architectural Katas is a team event. **Before submitting your request to participate, please be sure your team includes 3–5 people.**
- No personal information please. Don't include team member names or email addresses. Your GitHub repo shouldn't include your team's names or workplaces.
- Refer [here](#) for details on the problem and information about Farmacy Foods.
- [Smart Fridge Specs](#)

Problems? Questions? Email katas@oreilly.com.

The screenshot shows the homepage of the FarmacyFood website as it would appear in a web browser. The top navigation bar includes links for 'ABOUT US', 'INTERESTED?', 'Sign Up', and a shopping cart icon showing '0'. The main visual is a close-up photograph of a bowl of shrimp soup garnished with cilantro and green onions. Overlaid on the image is the quote 'Let Food be Thy Medicine' in large white letters, with a smaller 'LEARN MORE >' button below it. Below this section is a green header area featuring the FarmacyFood logo, two black meal prep containers filled with pasta and vegetables, and a mobile device displaying the FarmacyFood app interface.

farmacyfood.com

ABOUT US INTERESTED? Sign Up 0

Let Food be Thy Medicine

LEARN MORE >

FarmacyFood

Healthy, locally sourced meals for delivery or pick-up.

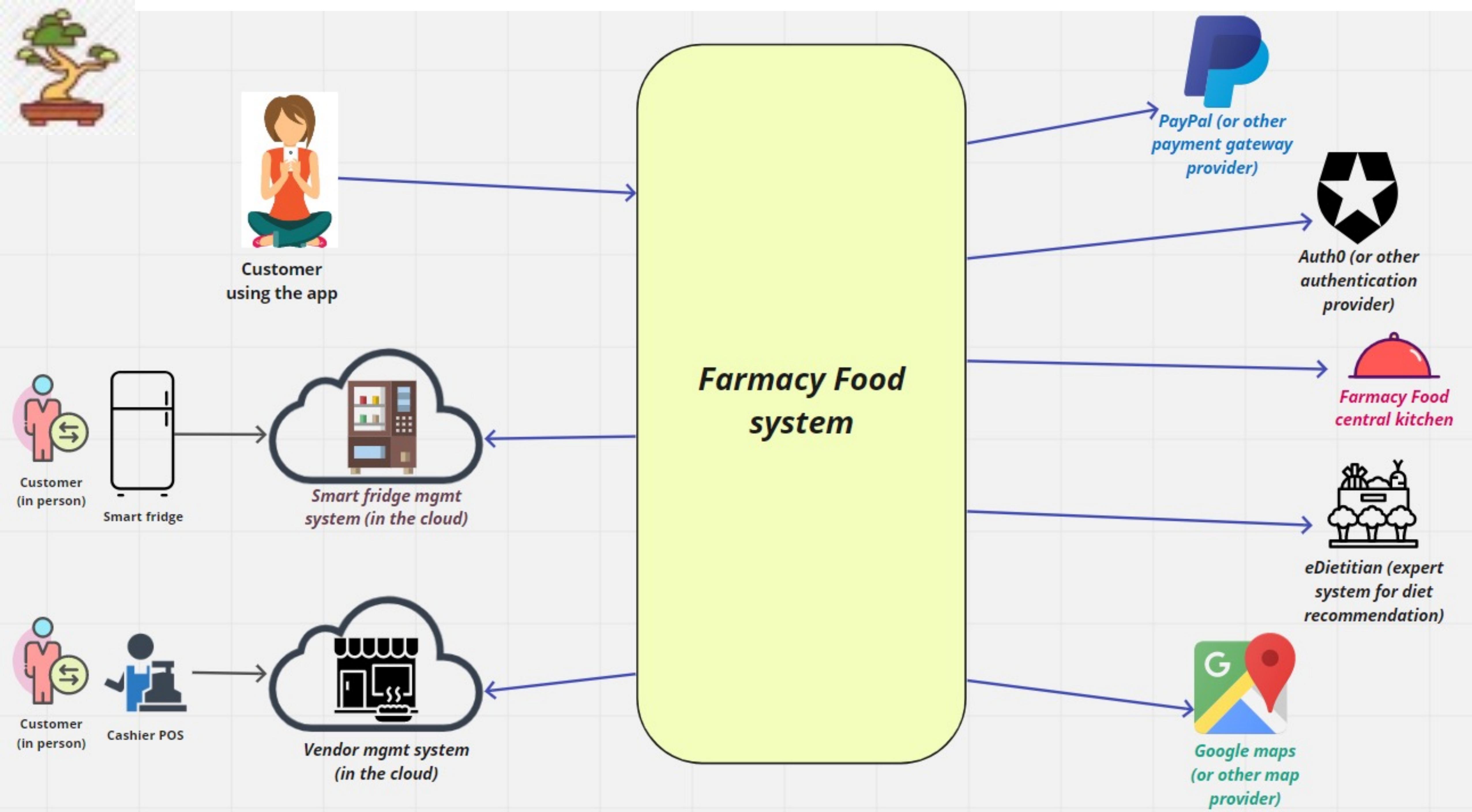
GET STARTED

Salads. Grain Bowls. Hot Plates.

OUR FOOD Our meals are chef-prepared, made from scratch daily, and inspired by the communities we serve.

OUR MISSION Our mission is to transform the food system by bringing healthy, affordable food into every community.

YOUR IMPACT Every meal you purchase helps support our mission to bring healthy food to underserved communities across the country.



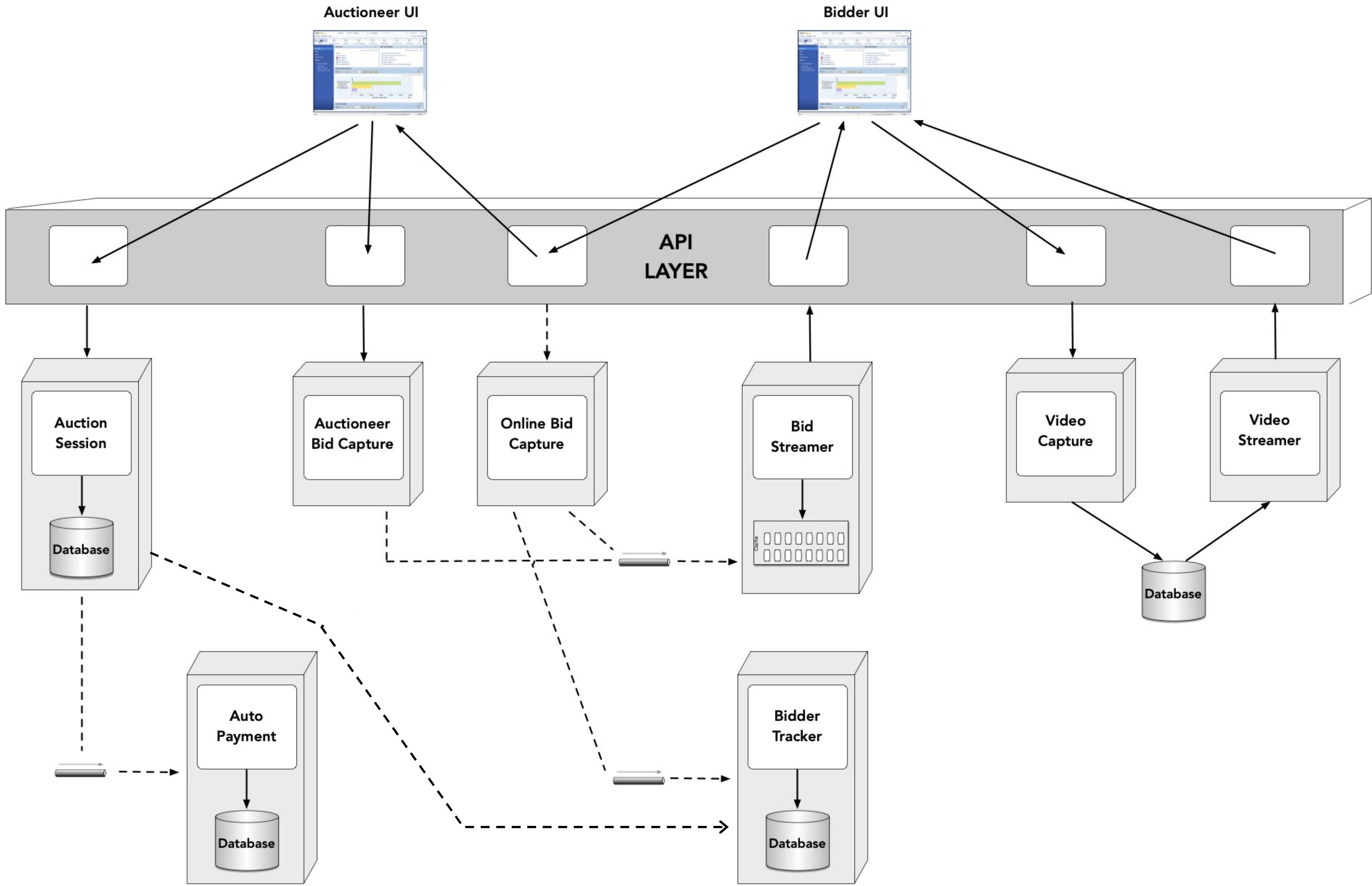
...and now ...

Architecture Katas 2021^{}*

The deliverables

Your Architectural Kata is...

Going Going Gone!



1. Separate Queues for Bid Streamer and Tracker Services

Status

Accepted

Context

The Bid Capture Services, upon receiving a bid, must forward that bid to the Bid Streamer Service and the Bidder Tracker Service. This could be done using a single topic (pub/sub) or separate queues (p2p) for each service.

Decision

We will use separate queues for the Bid Streamer and Bidder Tracker services.

Multiple bids will come in for the same ask amount. The Streamer service only needs the first bid received for that amount, whereas the Bidder Tracker needs all bids received. Using a topic (pub/sub) would require the Bid Streamer to contain logic to ignore bids that are the same as the prior amount, forcing the Bid Streamer to store shared state between instances.

The Bid Streamer Service stores the bids for an item in an in-memory cache, whereas the Bidder Tracker stored bids in a database. The Bidder Tracker will therefore be slower and might require back pressure. Using a dedicated Bidder Tracker queue provides this dedicated back pressure point.

Consequences

This decision will require the Bid Capture services to send the same information to multiple queues.

architecture katas

identifying characteristics

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Going Going Gone!

An auction company wants to take their auctions online to a nationwide scale--customers choose the auction to participate in, wait until the auction begins, then bid during the live auction as if they were there in the room, with the auctioneer.

- **Users:** scale up to hundreds of participants (per auction), potentially up to thousands of participants, and as many simultaneous auctions as possible
- **Requirements:**
 - bidders can see a live video stream of the auction and see all bids as they occur
 - auctions must be as real-time as possible
 - both online and live bids must be received in the order in which they are placed
 - video stream of the action after the fact
 - bidders register with credit card; system automatically charges card if bidder wins
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- **Additional Context:**
 - auction company is expanding aggressively by merging with smaller competitors
 - if nationwide auction is a success, replicate the model overseas
 - budget is not constrained--this is a strategic direction
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availability reliability performance

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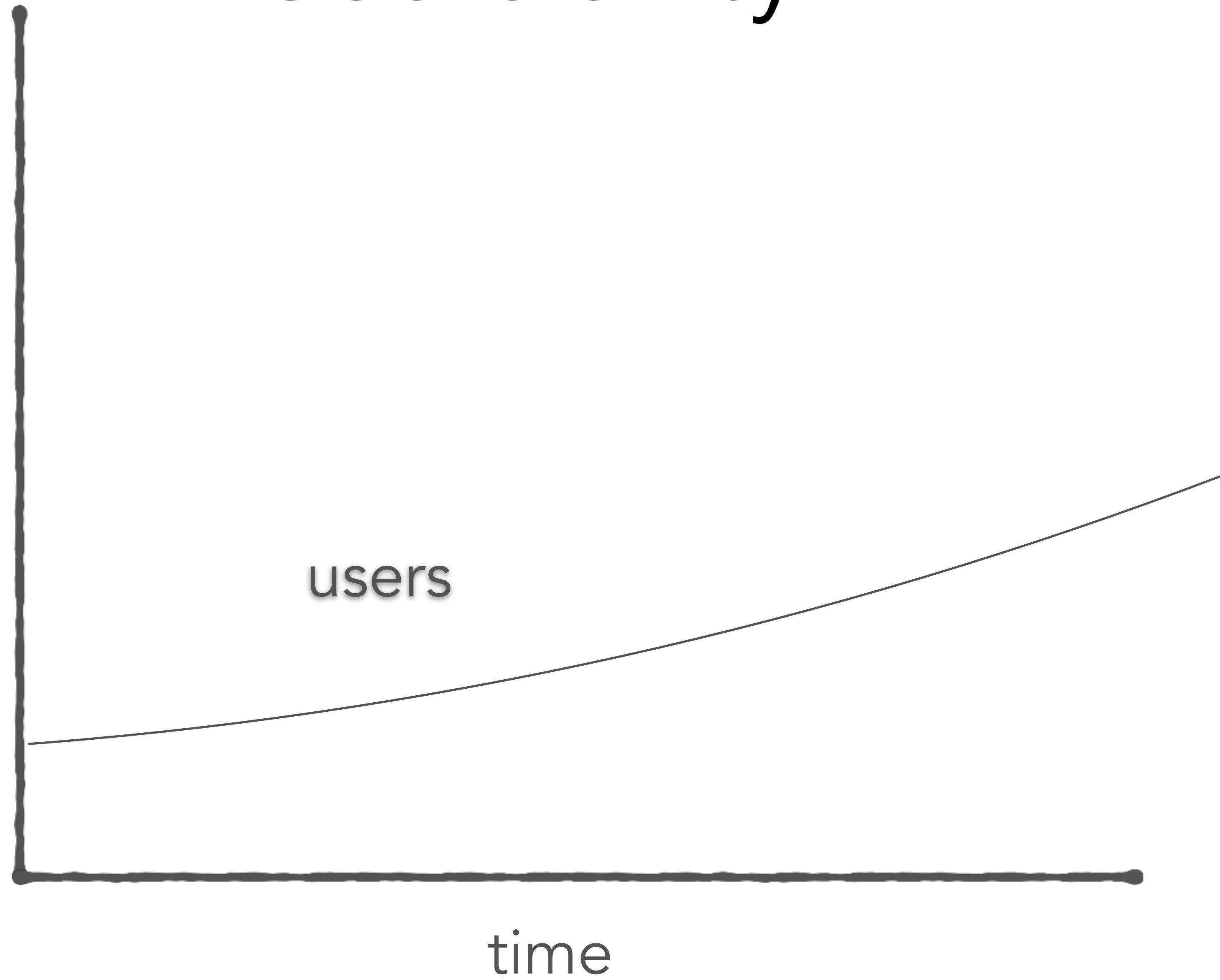
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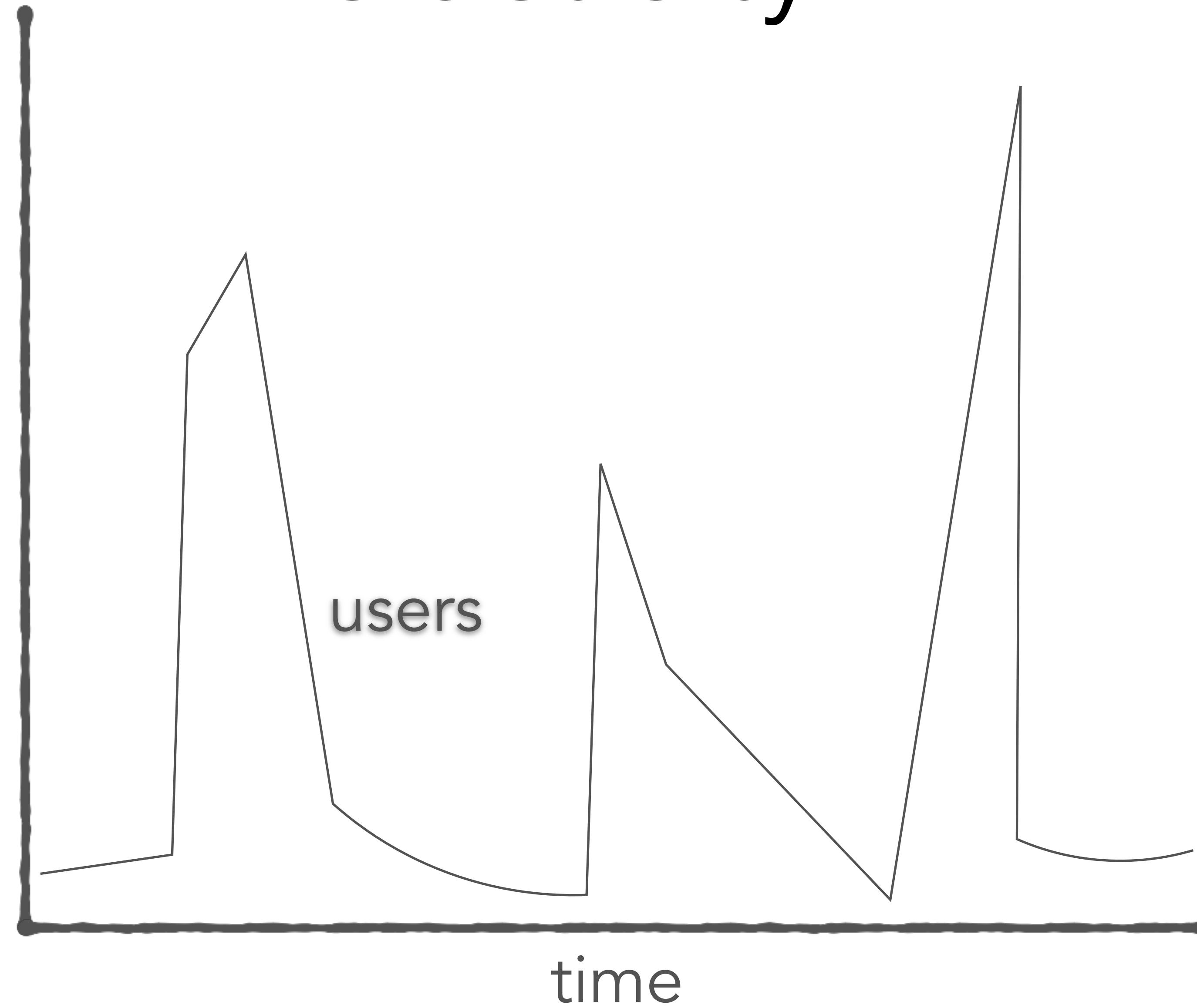
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availability reliability performance scalability elasticity

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elasticity:



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availability reliability performance scalability elasticity (security)

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architecture katas

identifying major components

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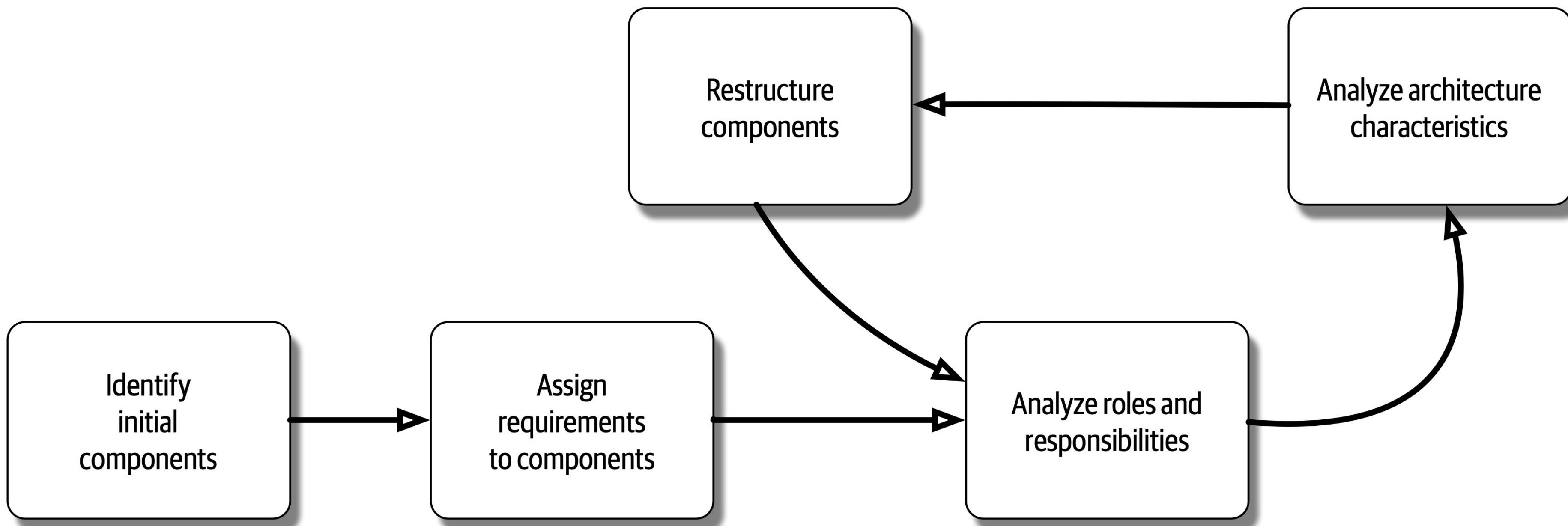
Your Architectural Kata is...

Silicon Sandwiches

A national sandwich shop wants to enable 'fax in your order' but over the Internet instead (in addition to their current fax-in service)

- **Users:** thousands, perhaps one day millions
- **Requirements:**
 - users will place their order, then be given a time to pick up their sandwich and directions to the shop (which must integrate with several external mapping services that include traffic information)
 - if the shop offers a delivery service, dispatch the driver with the sandwich to the user
 - mobile-device accessibility
 - offer national daily promotional specials
 - offer local daily promotional specials
 - accept payment online or in person/on delivery
- **Additional Context:**
 - Sandwich shops are franchised, each with a different owner.
 - Parent company has near-future plans to expand overseas.
 - Corporate goal is to hire inexpensive labor to maximize profit.

component identification



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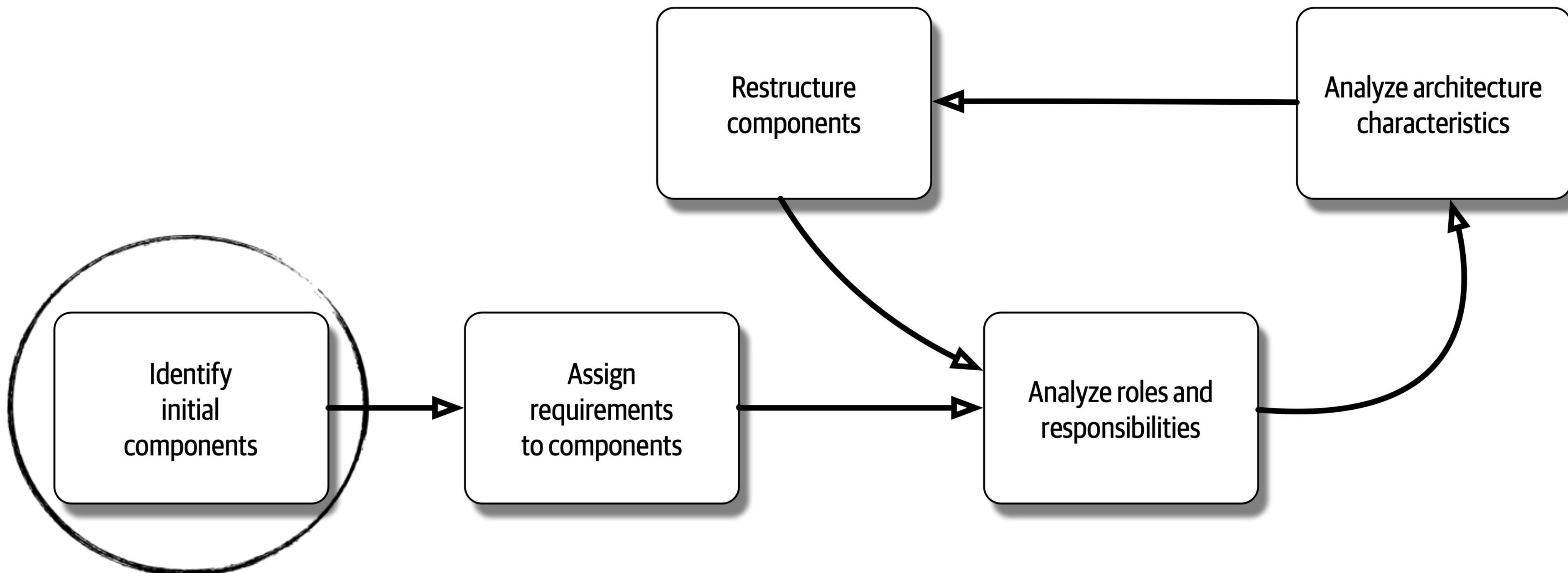
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Going Going Gone!



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the “entity trap”

auctions

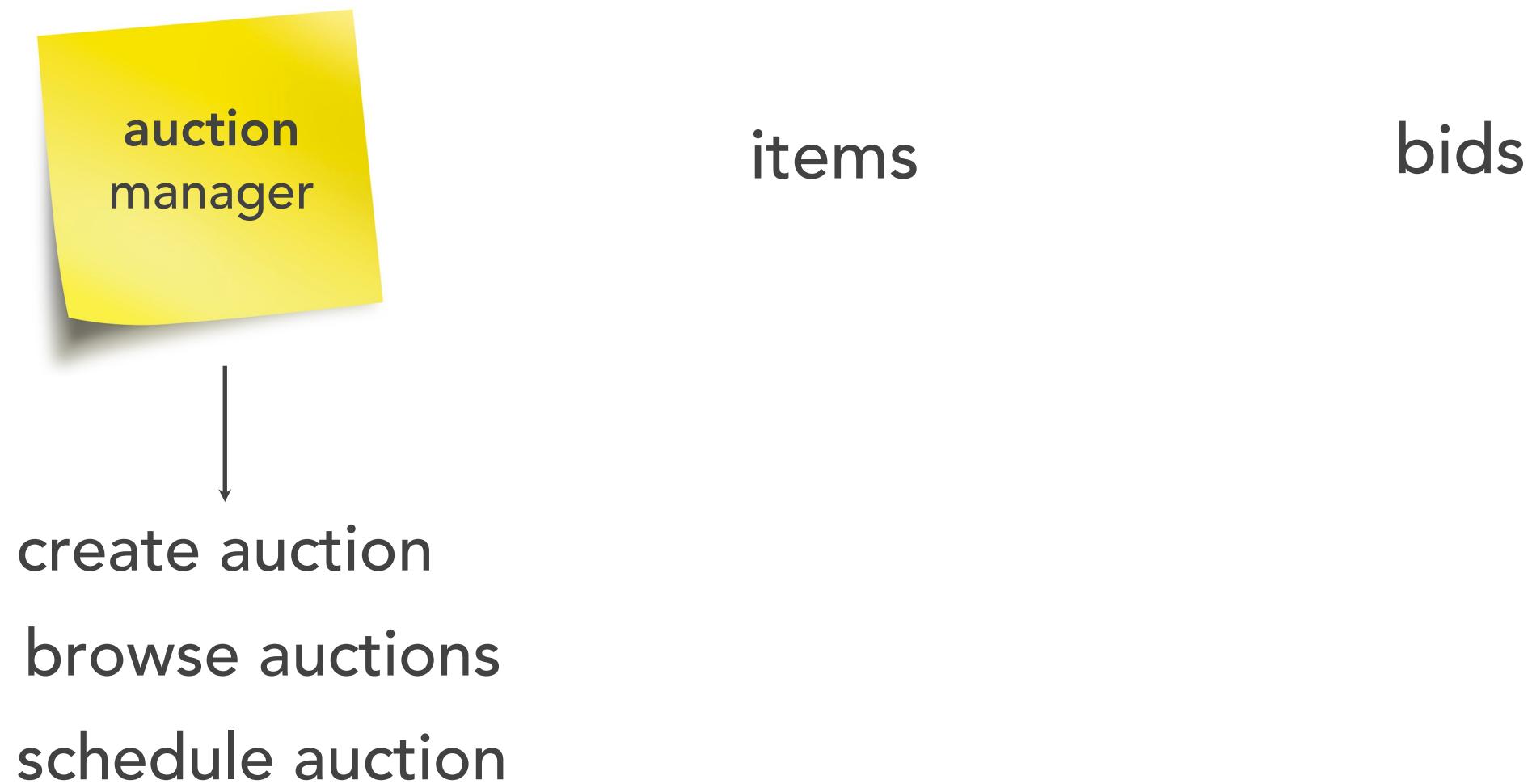
items

bids

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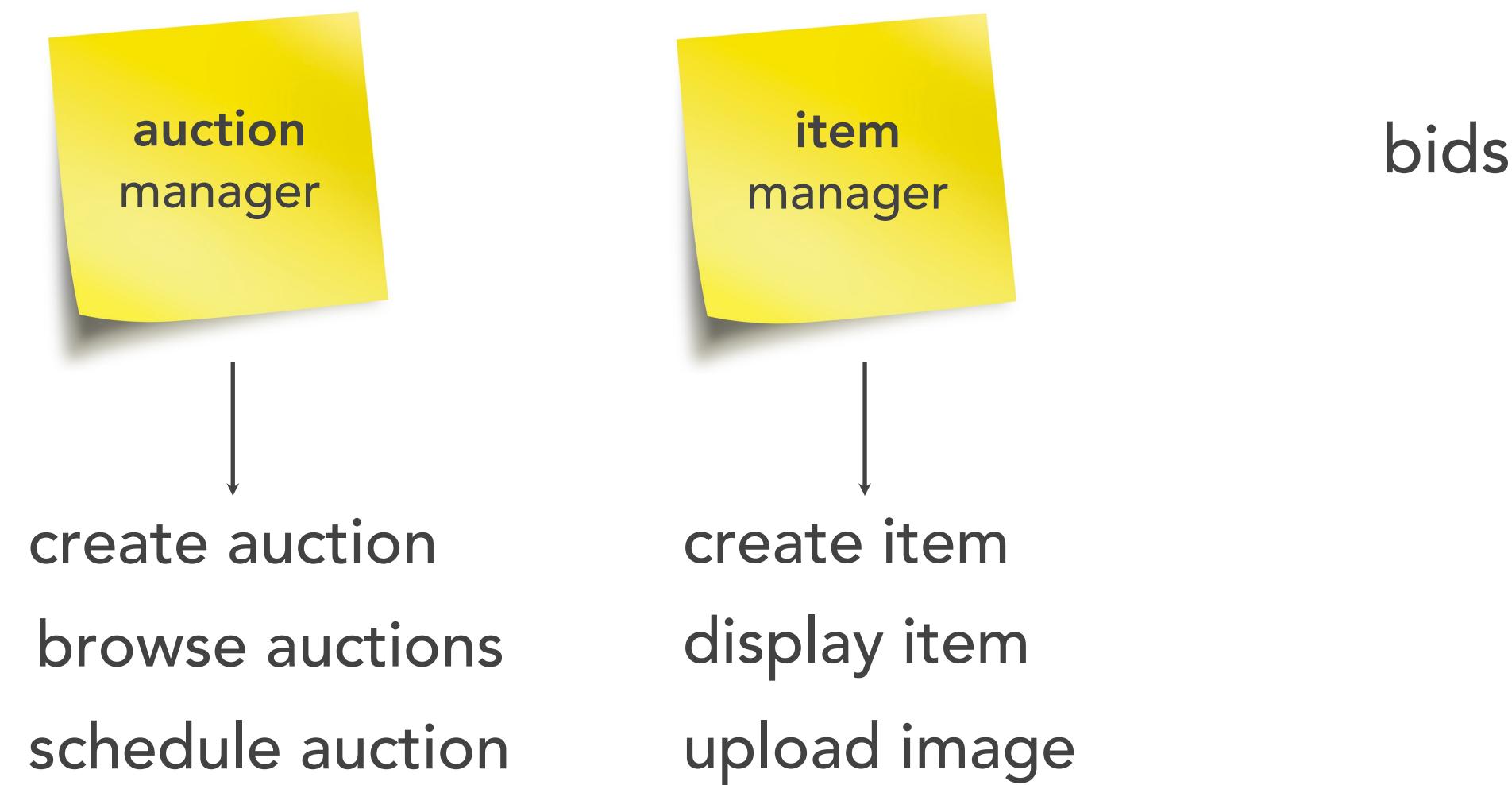
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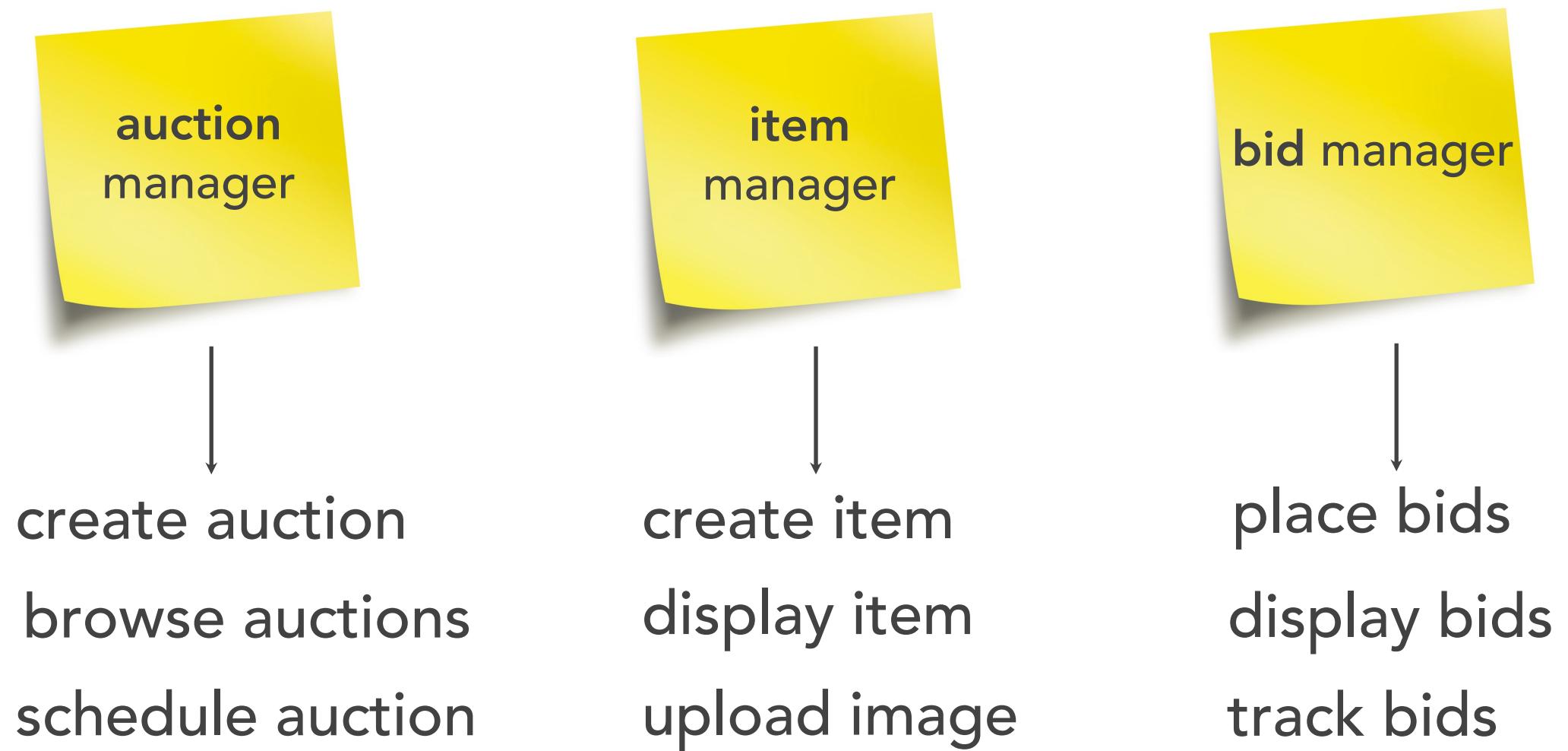
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the “entity trap”



Your Architectural Kata is...

Going Going Gone!

workflow approach

create auction —> find auction —> sign up —> watch auction —> place bid

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Going Going Gone!

workflow approach

create auction —→ find auction —→ sign up —→ watch auction —→ place bid



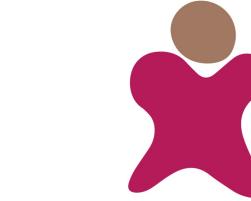
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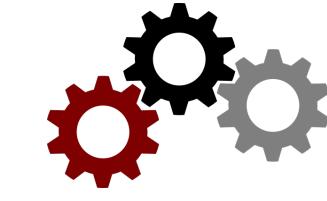
actor/action approach



bidder



auctioneer



system

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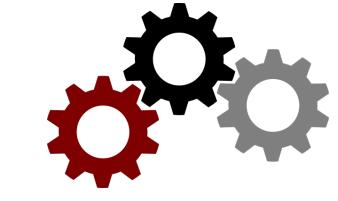
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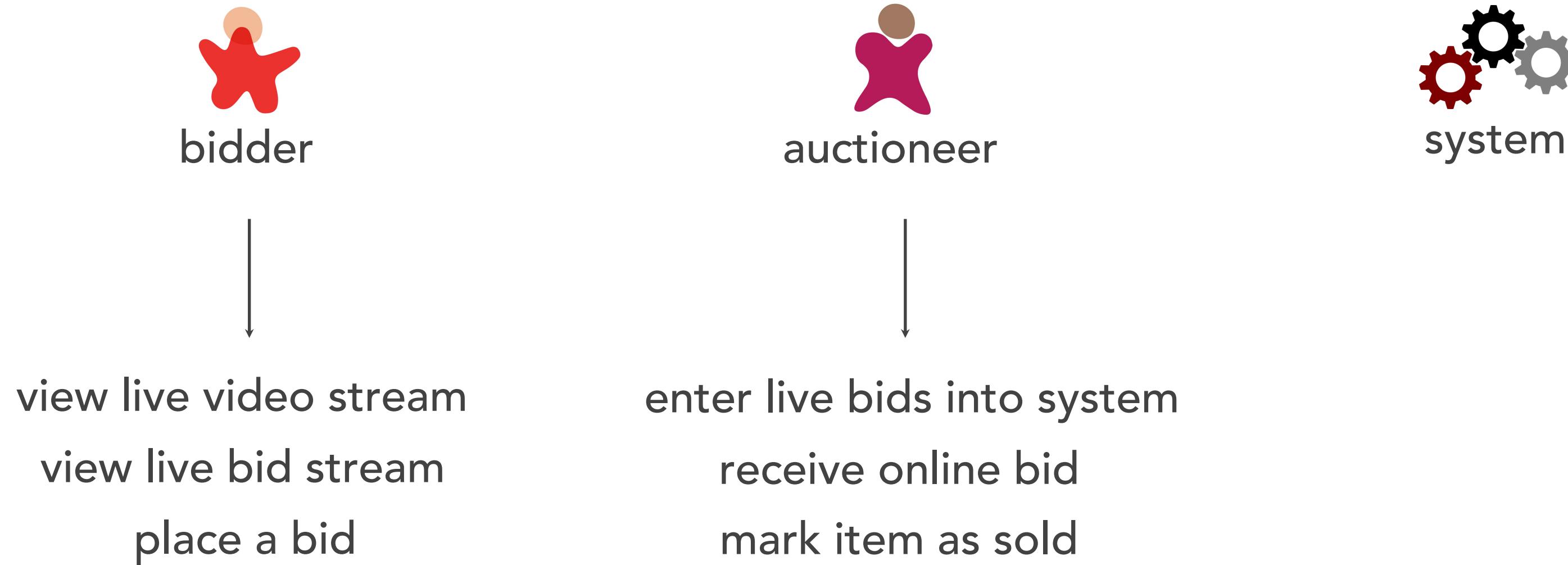


- view live video stream
- view live bid stream
- place a bid

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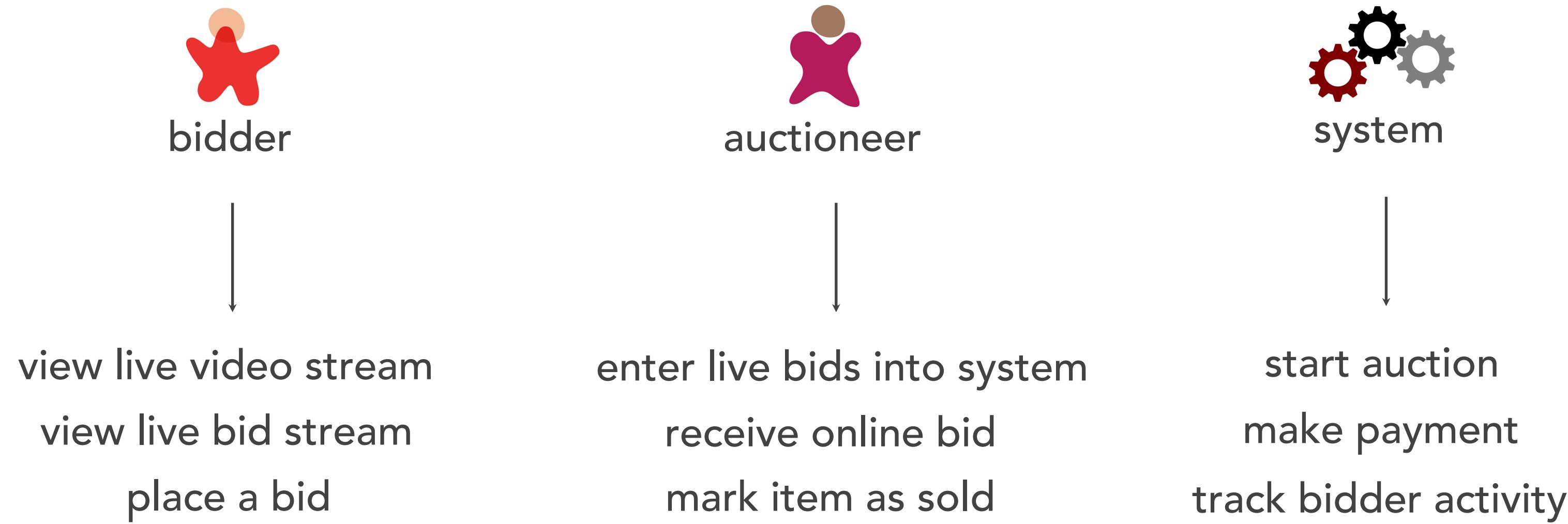
actor/action approach



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actor/action approach



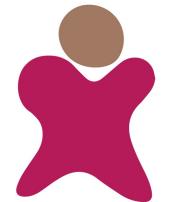
Your Architectural Kata is...

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bidder

- view live video stream
- view live bid stream
- place a bid



auctioneer

- receive online bid
- enter live bids into system
- mark item as sold



system

- start auction
- make payment
- track bidder activity

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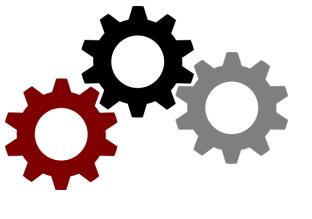
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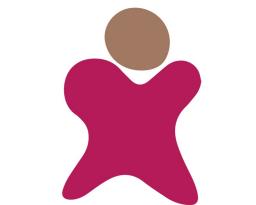
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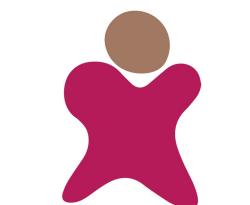
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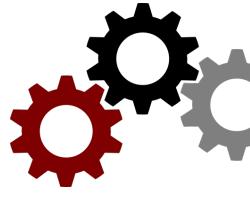
bidder

- view live video stream
- view live bid stream
- place a bid



auctioneer

- receive online bid
- enter live bids into system
- mark item as sold



system

- ✓ start auction
- make payment
- track bidder activity



Your Architectural Kata is...

Going Going Gone!

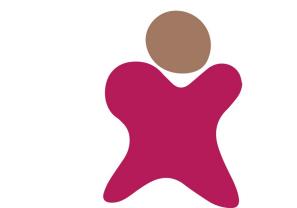


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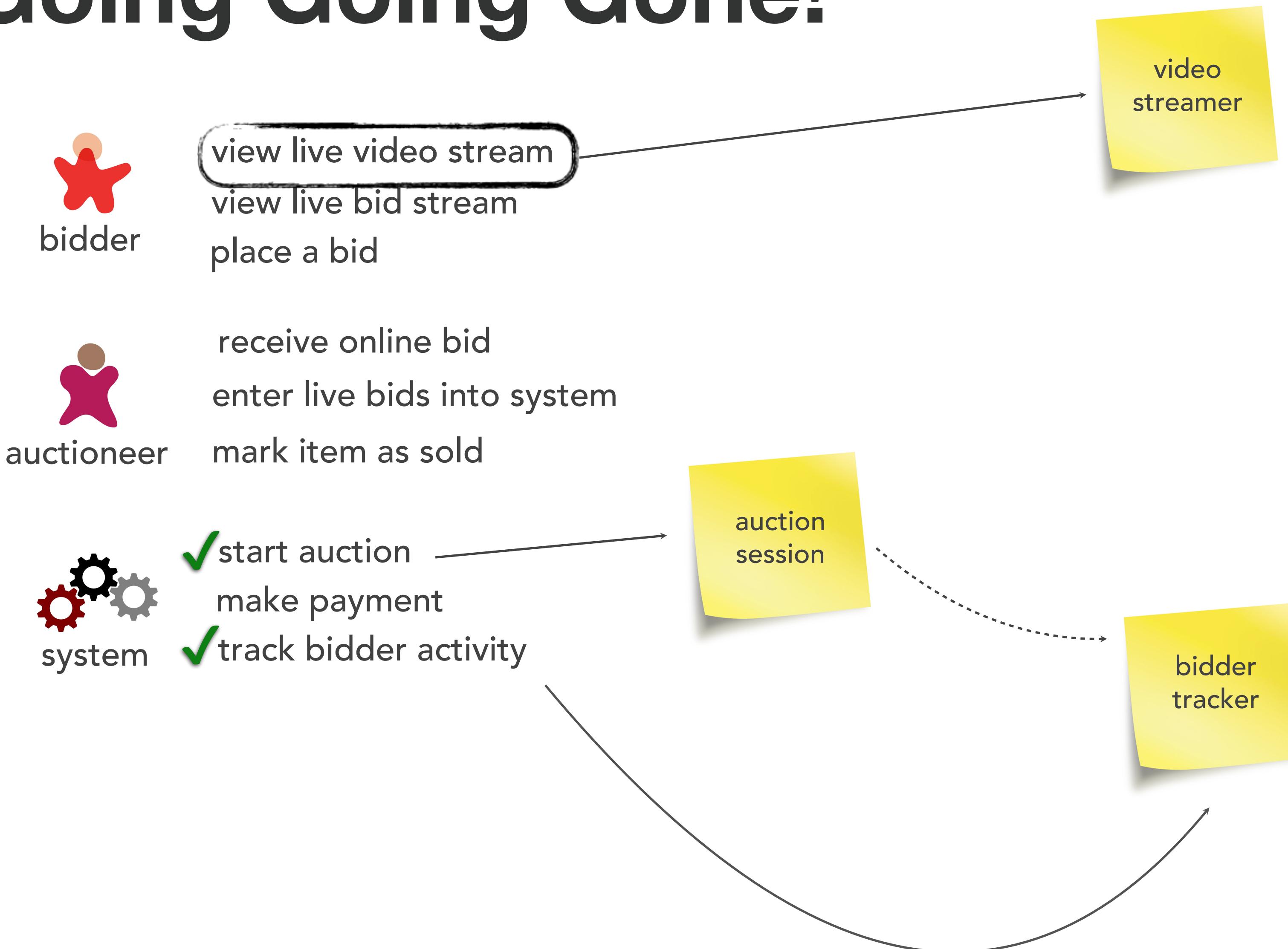
auction
session

bidder
tracker



Your Architectural Kata is...

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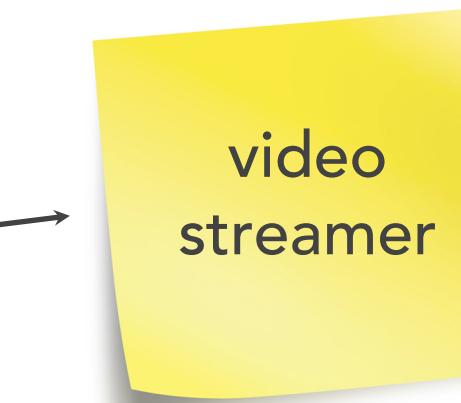
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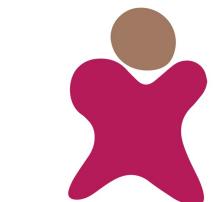


bidder

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- view live bid stream
- place a bid



video
streamer



auctioneer

- receive online bid
- enter live bids into system
- mark item as sold



system

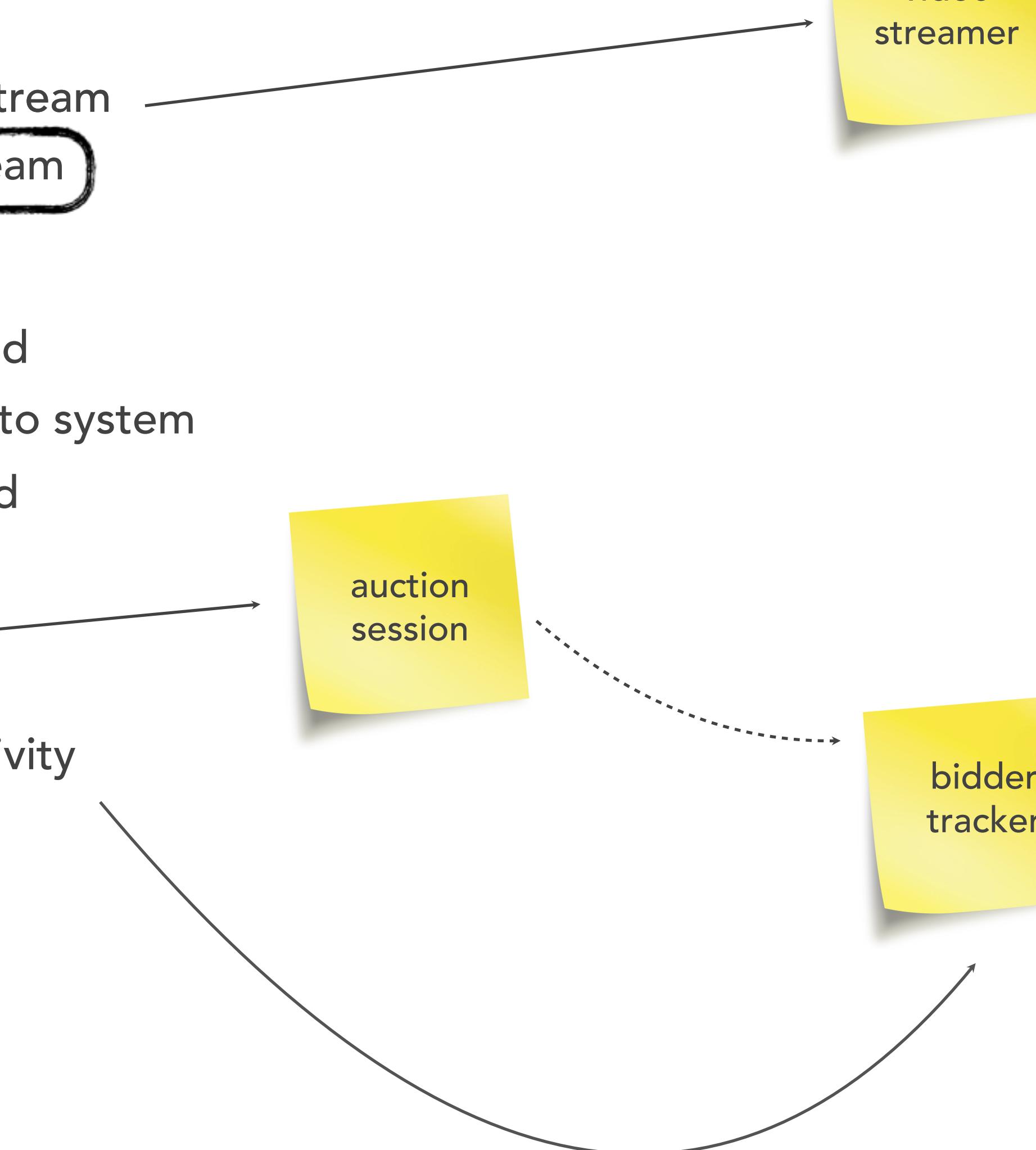
- ✓ start auction
- make payment
- ✓ track bidder activity



auction
session

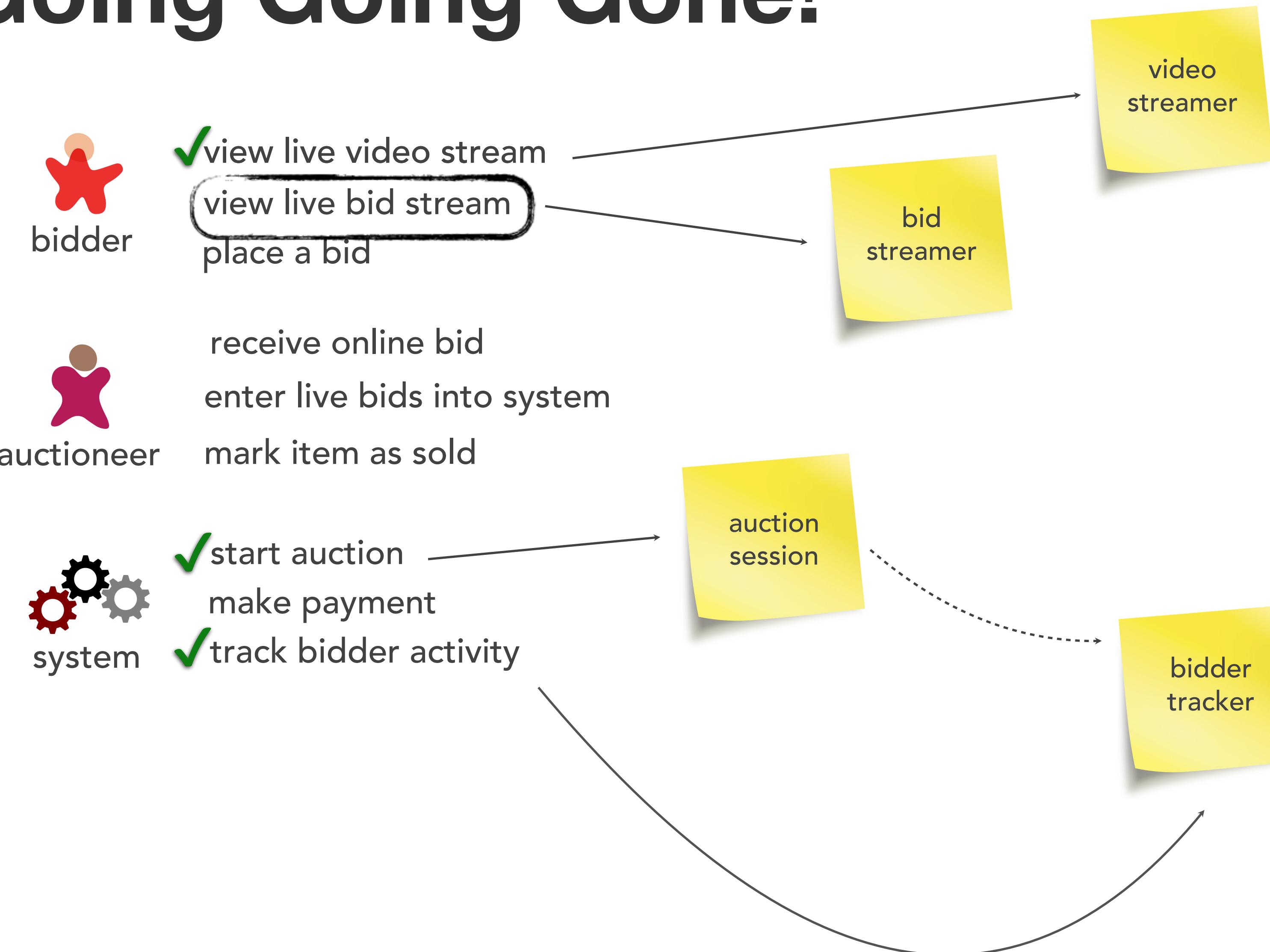


bidder
tracker



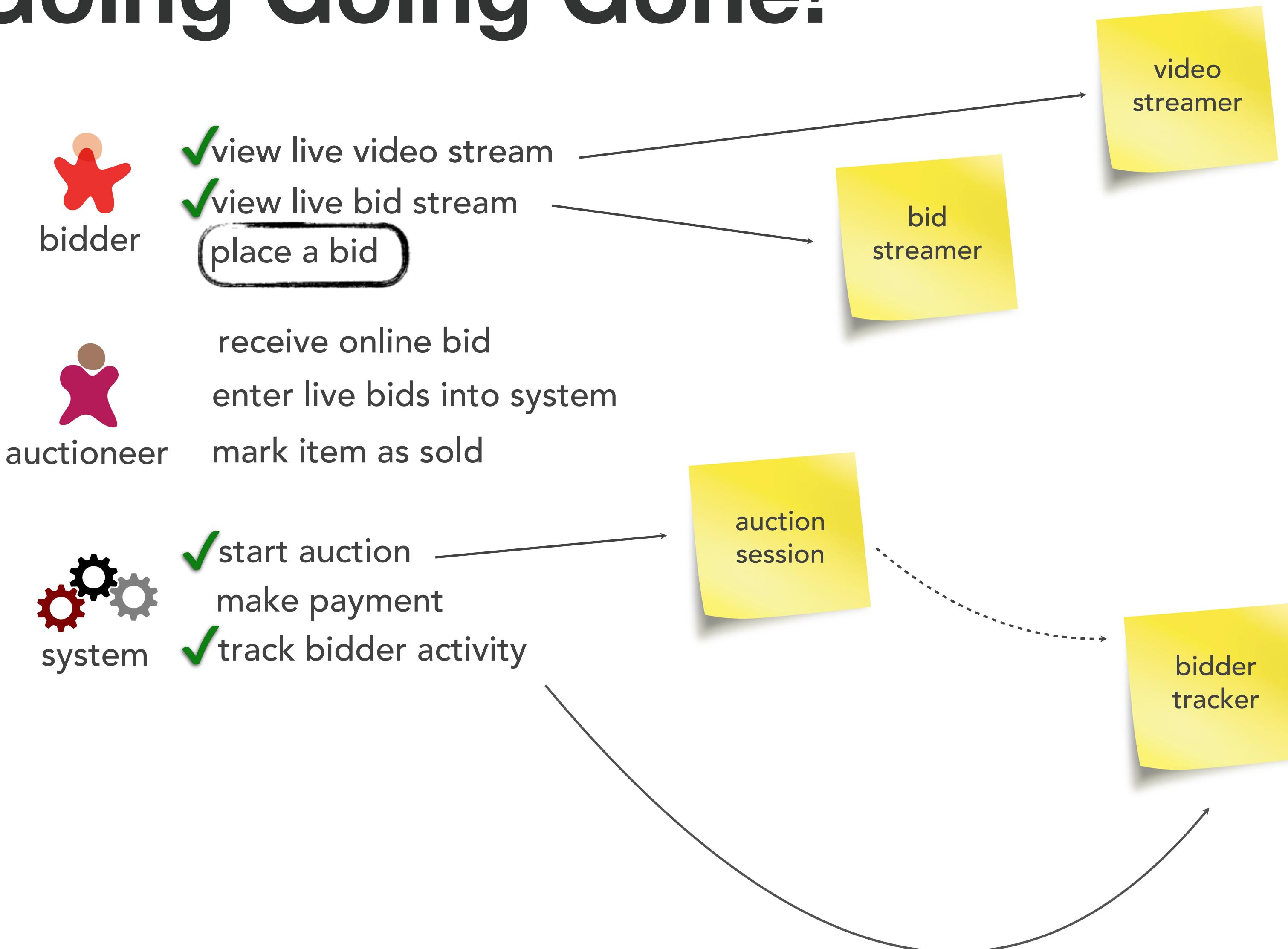
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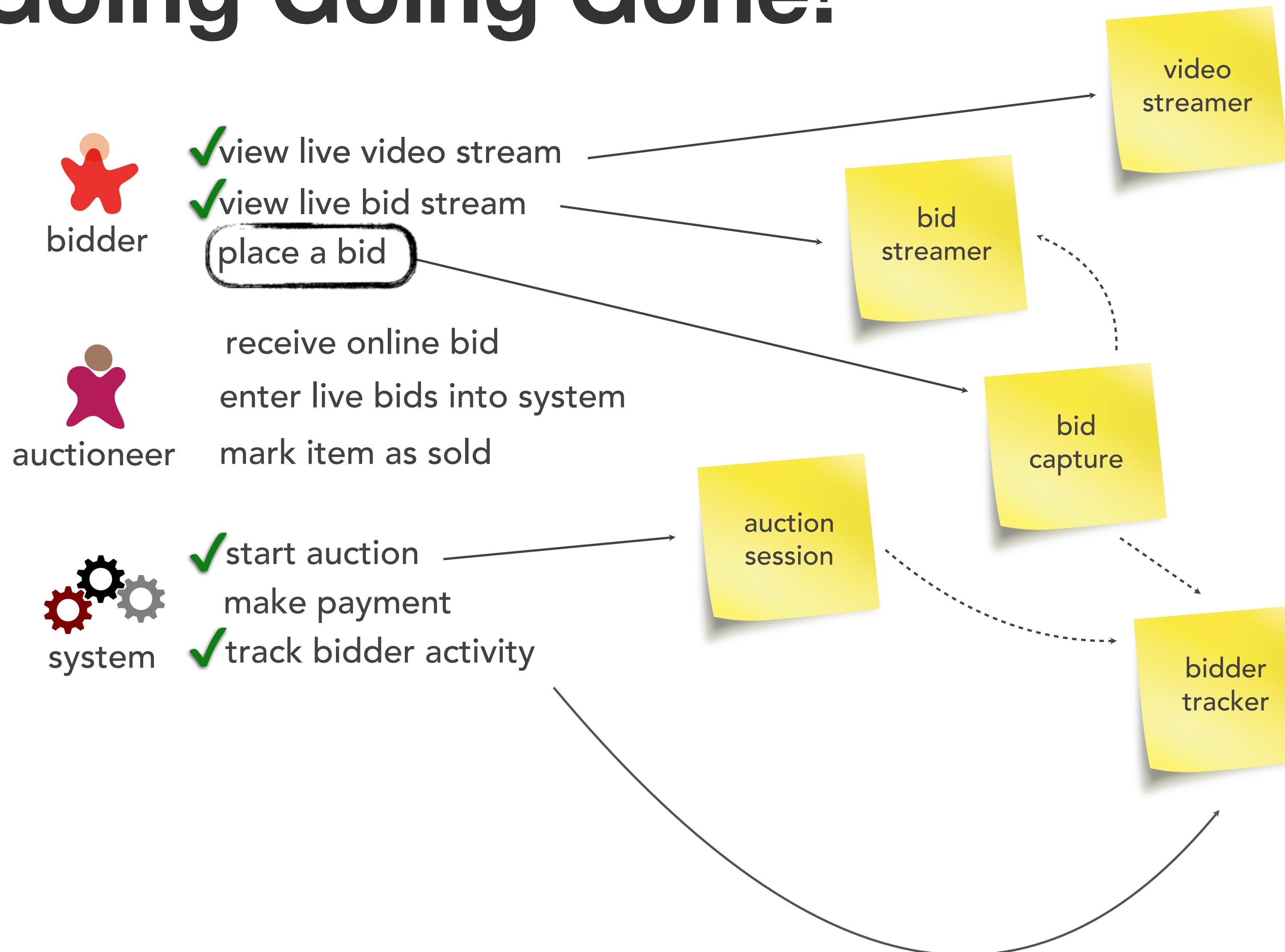
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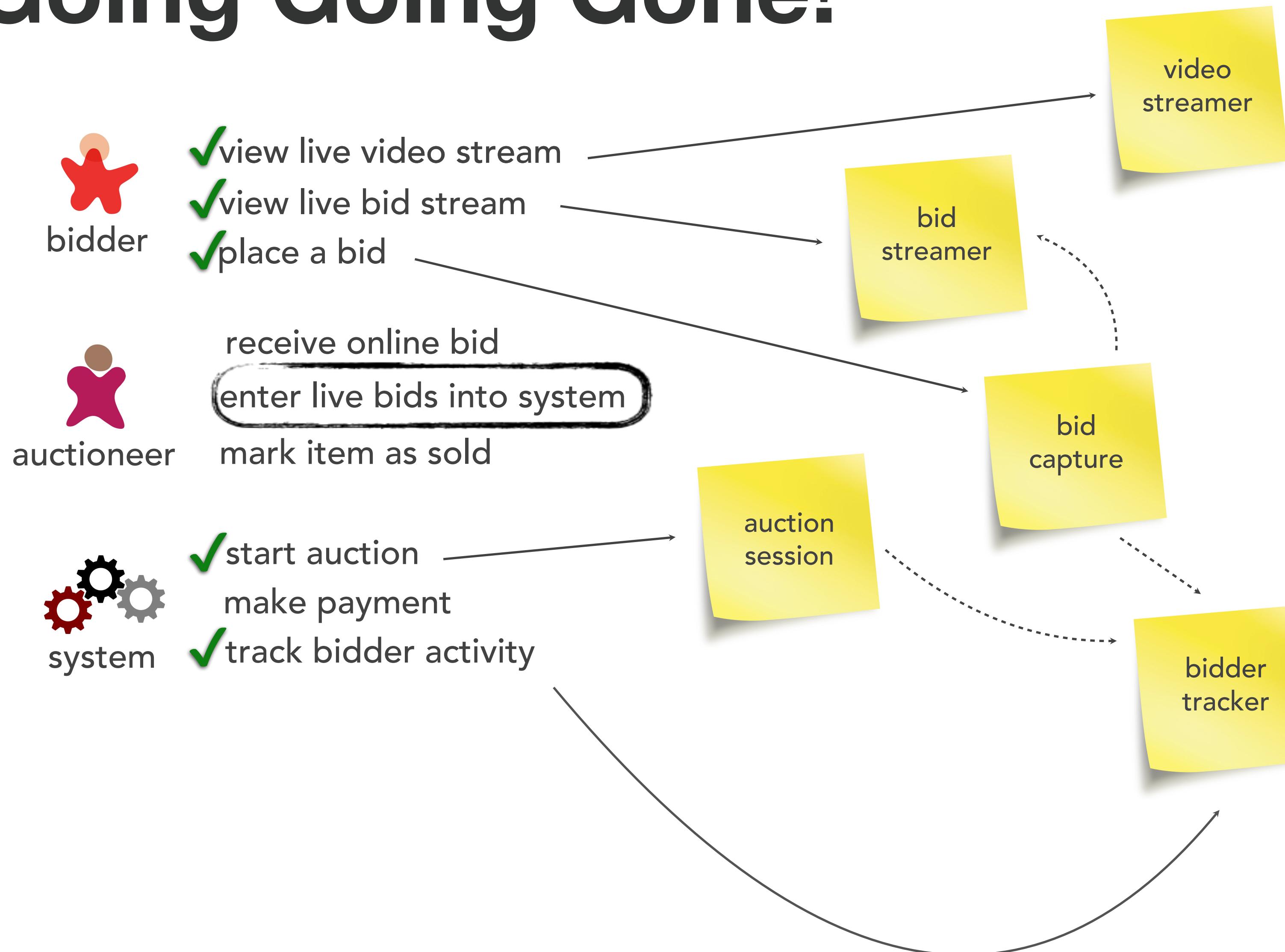
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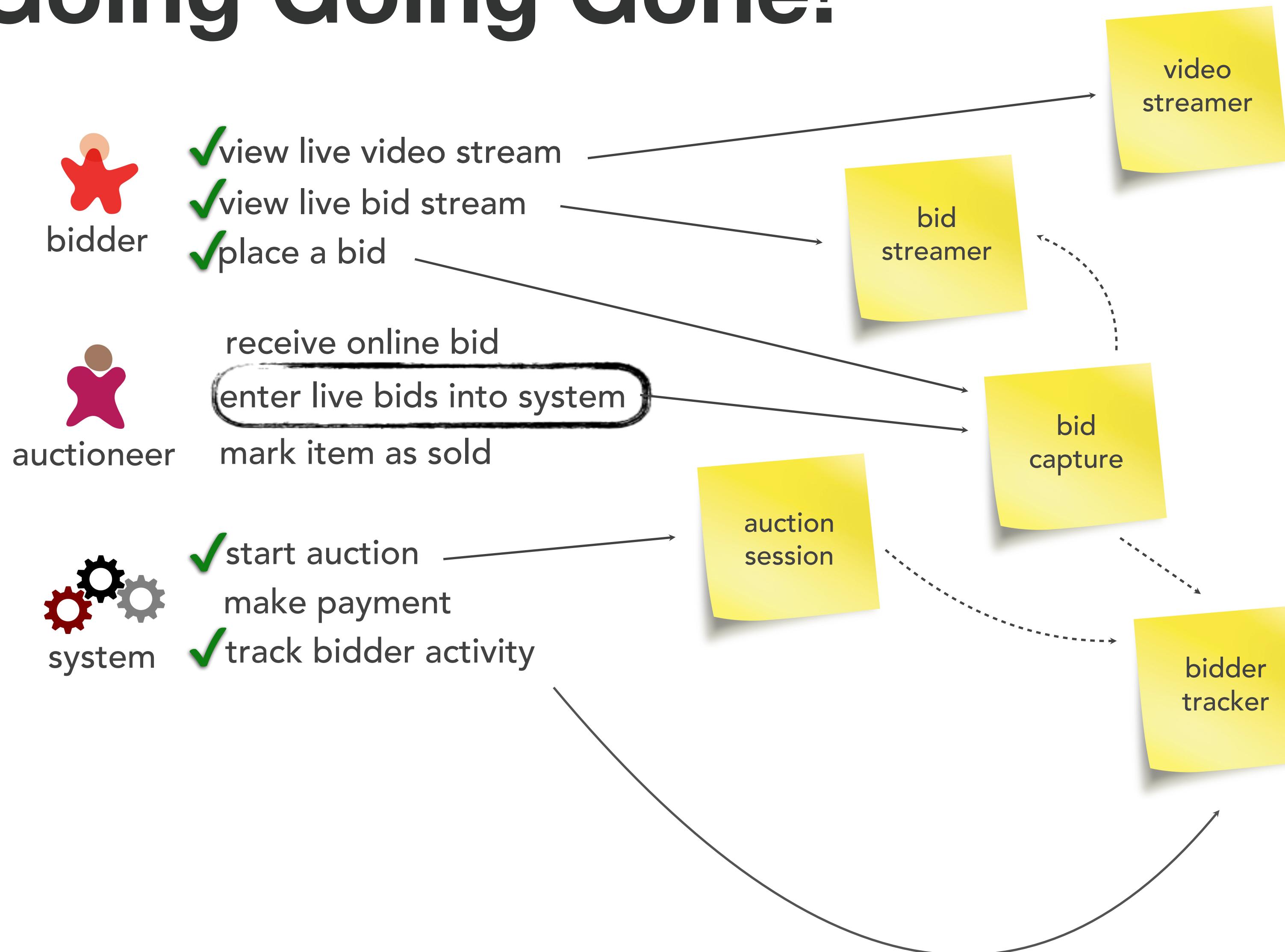
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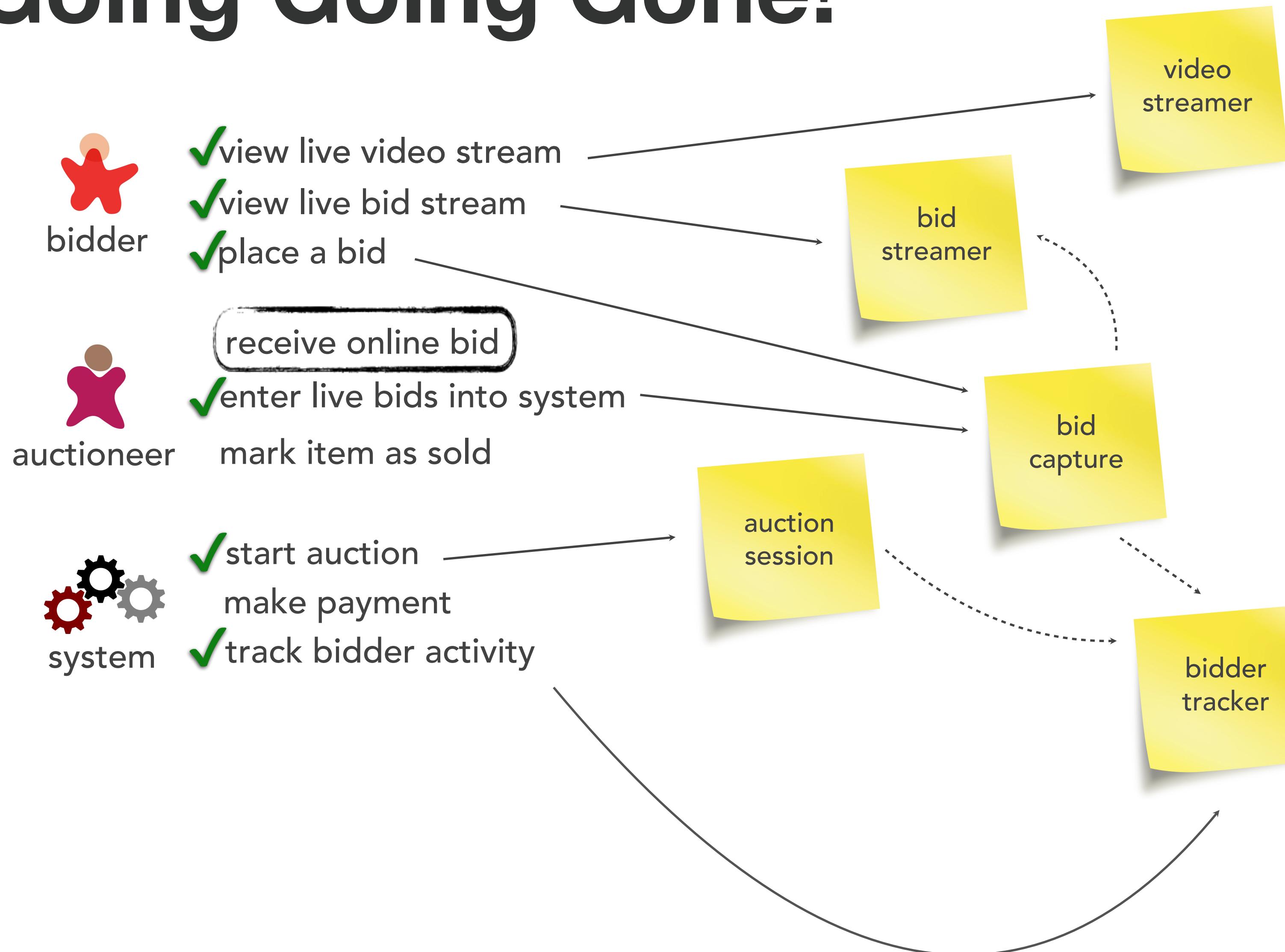
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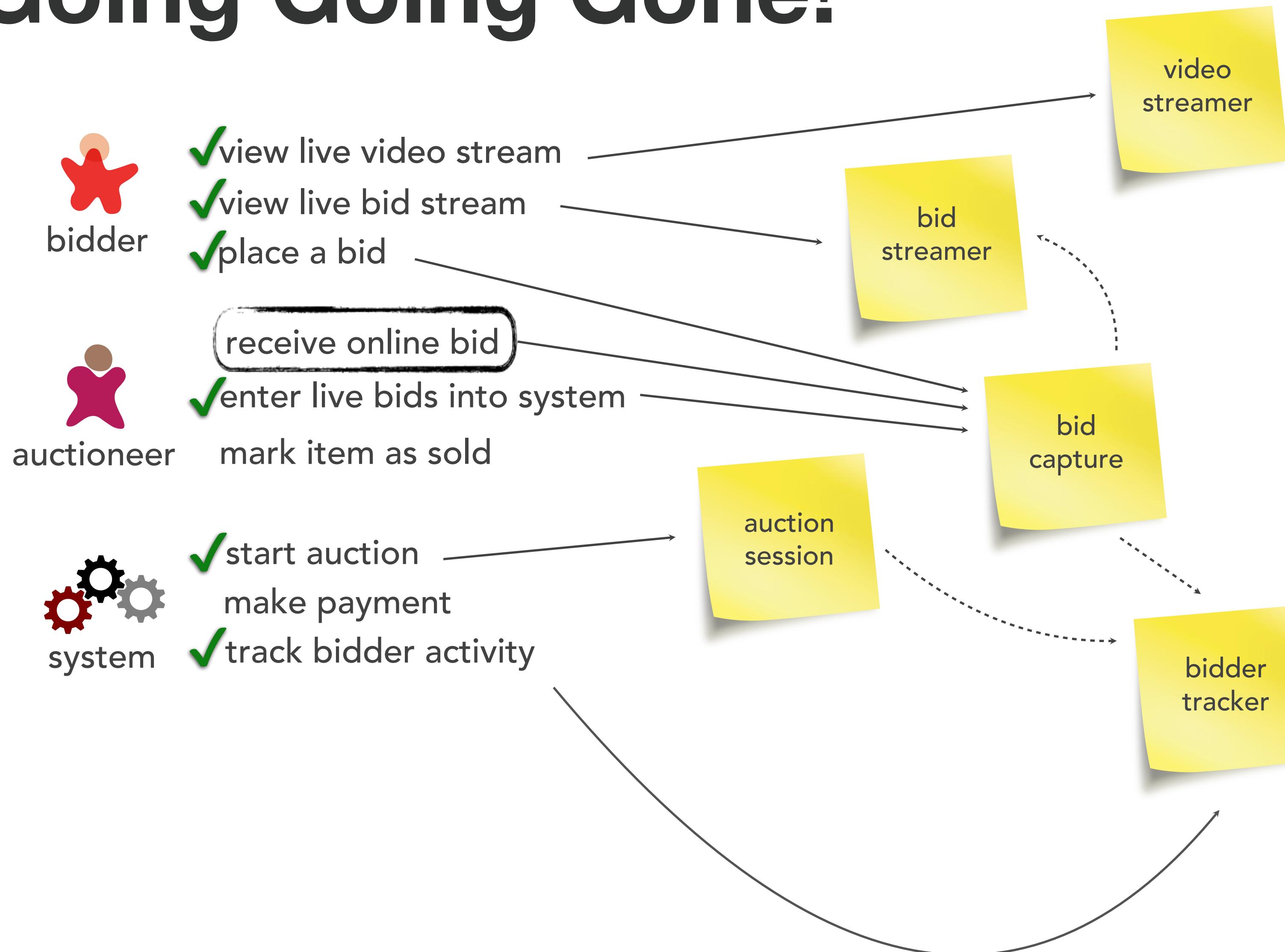
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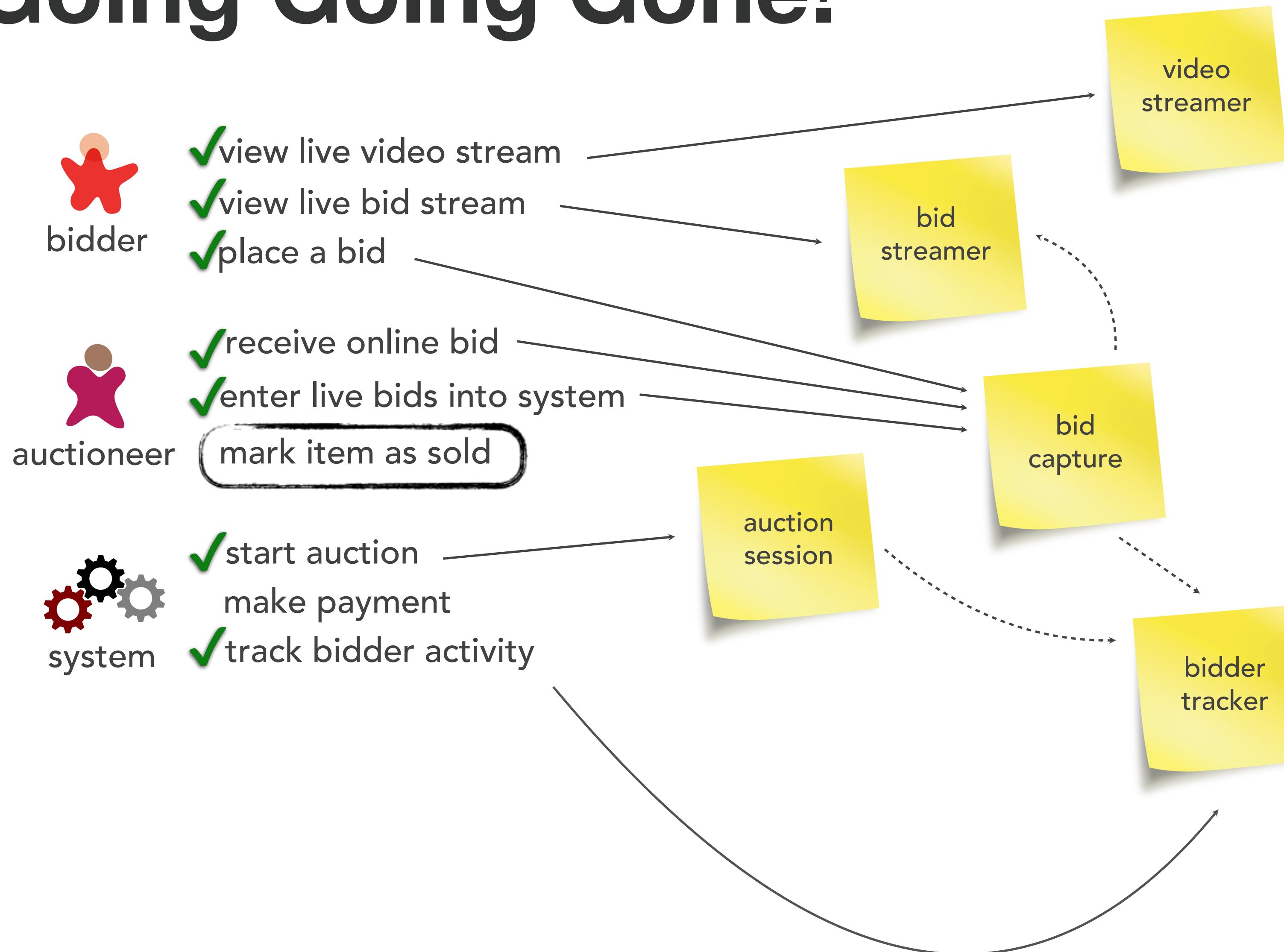
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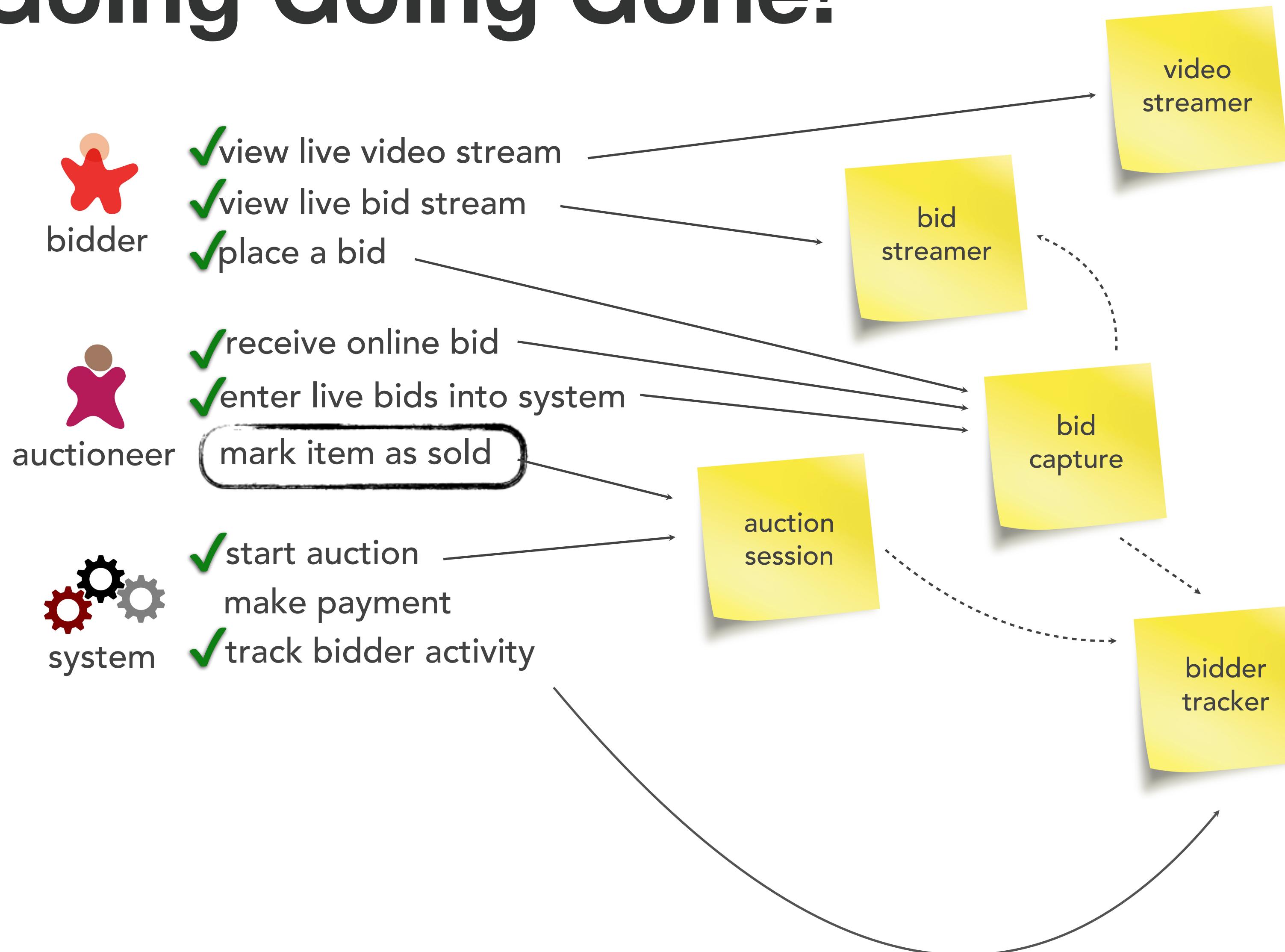
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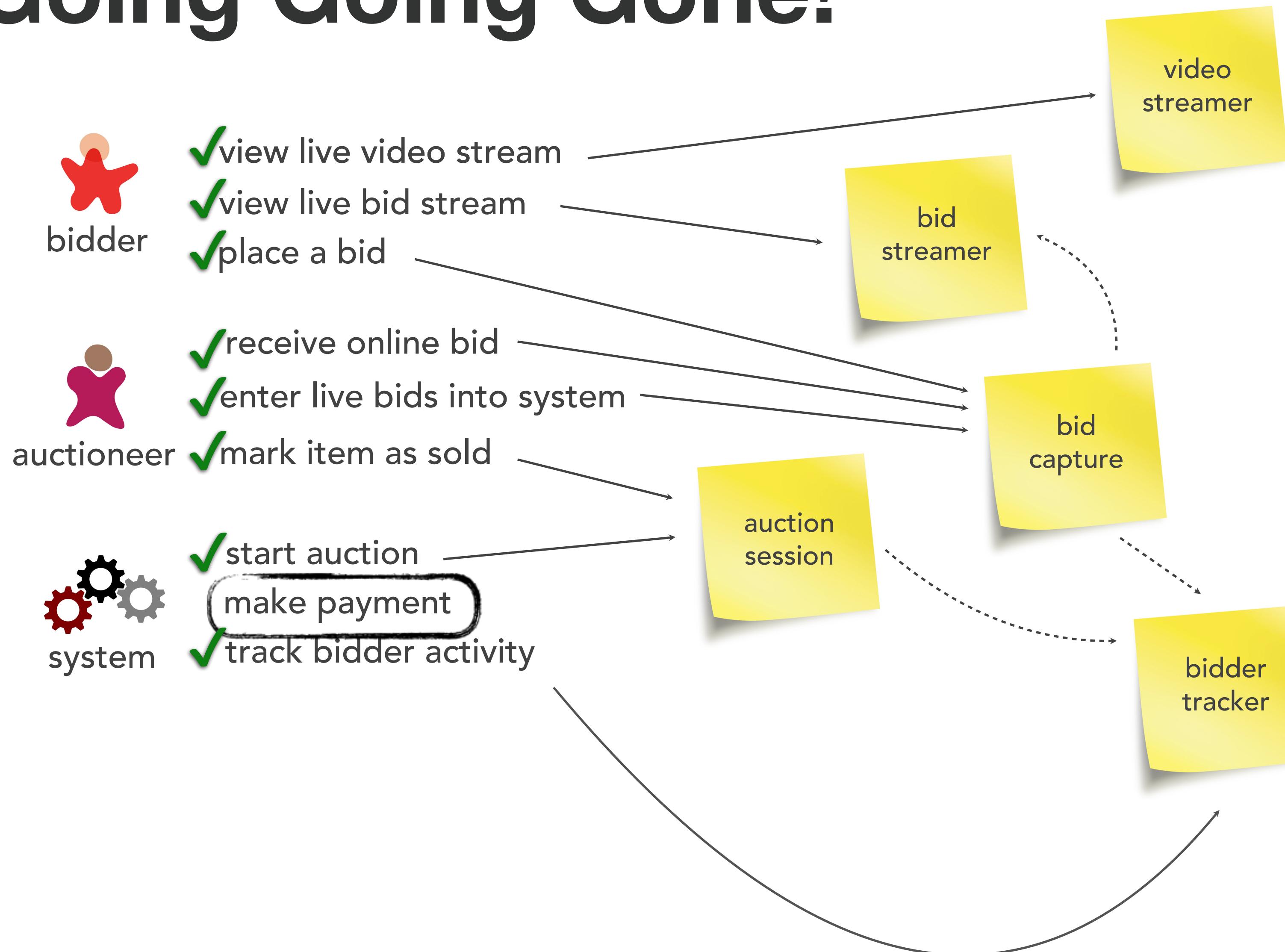
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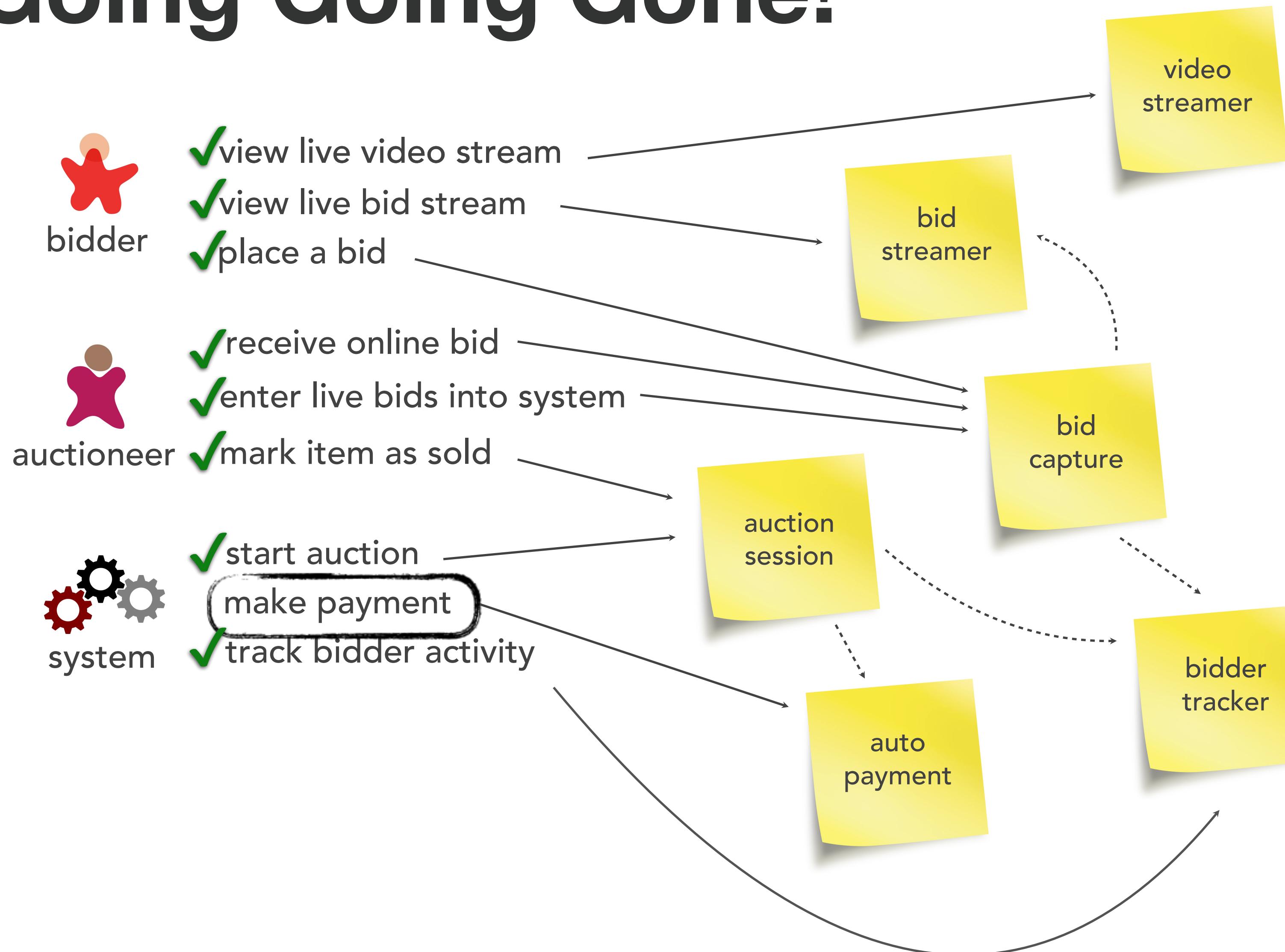
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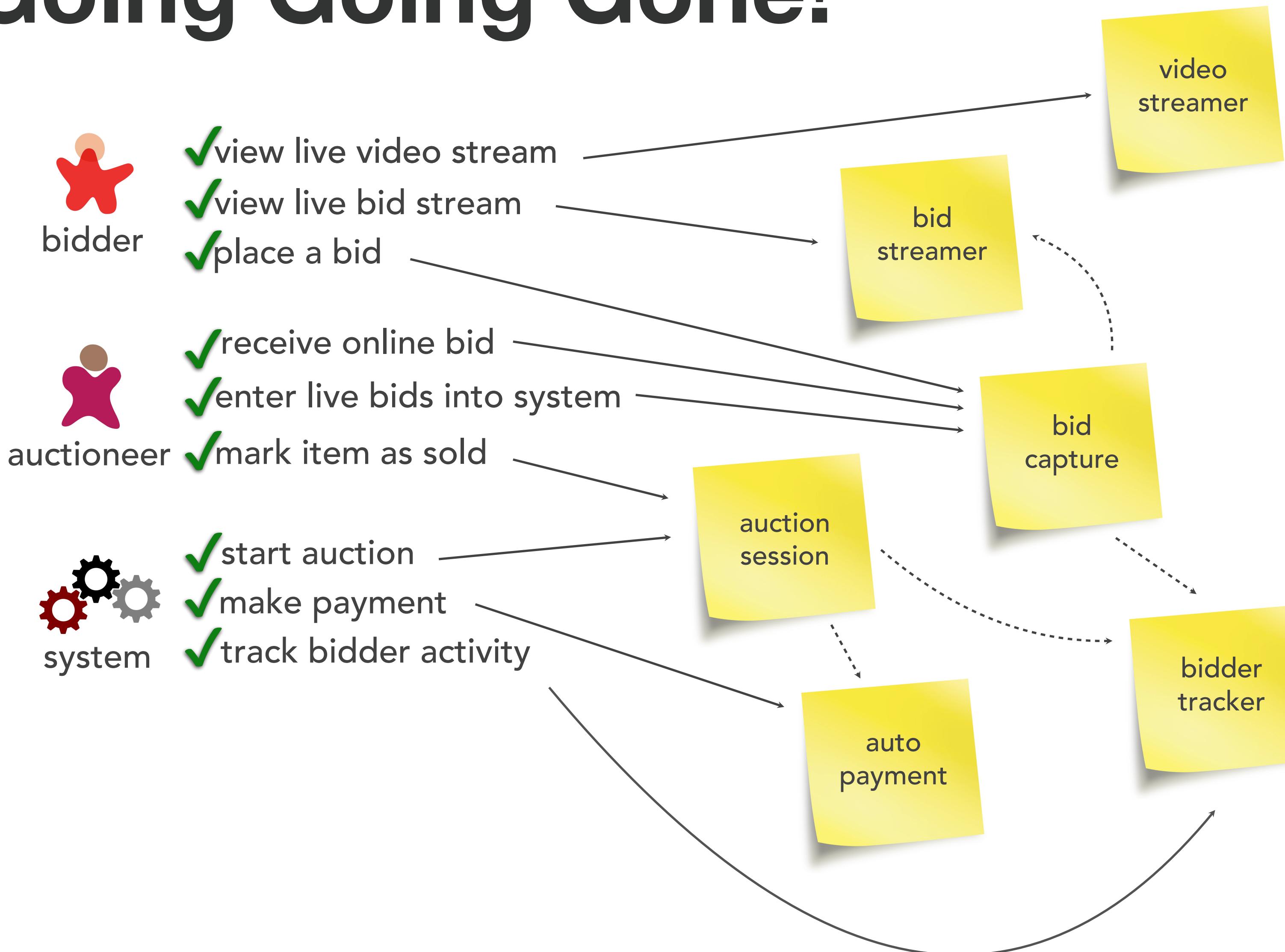
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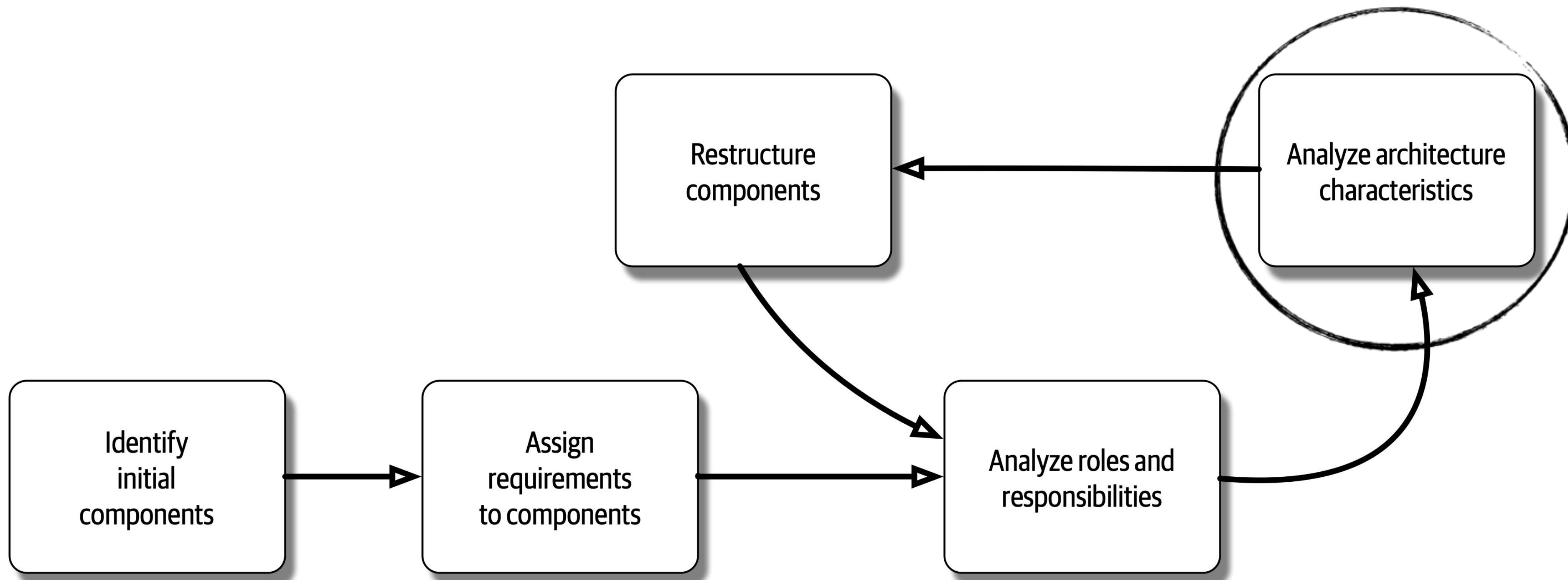
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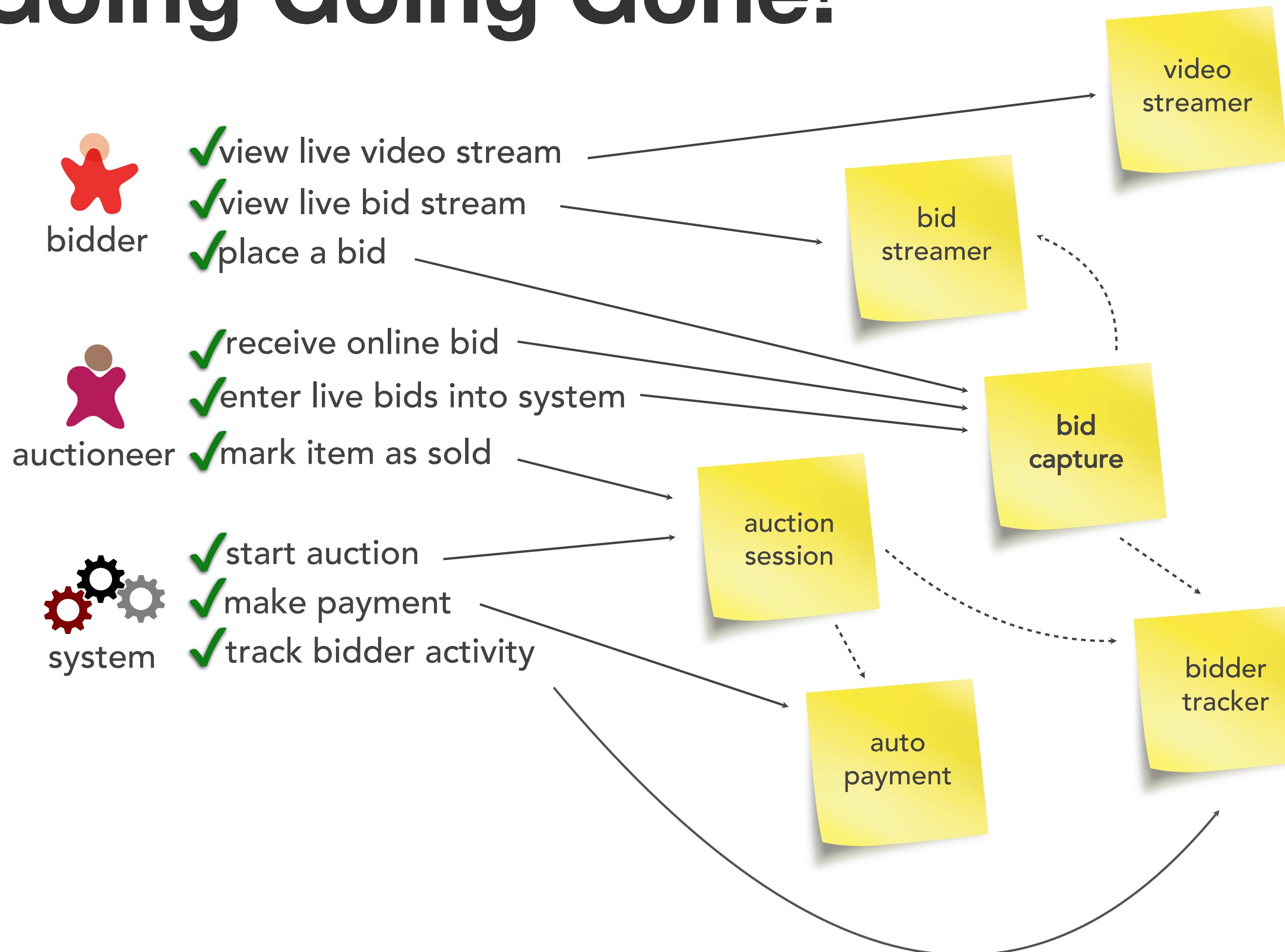
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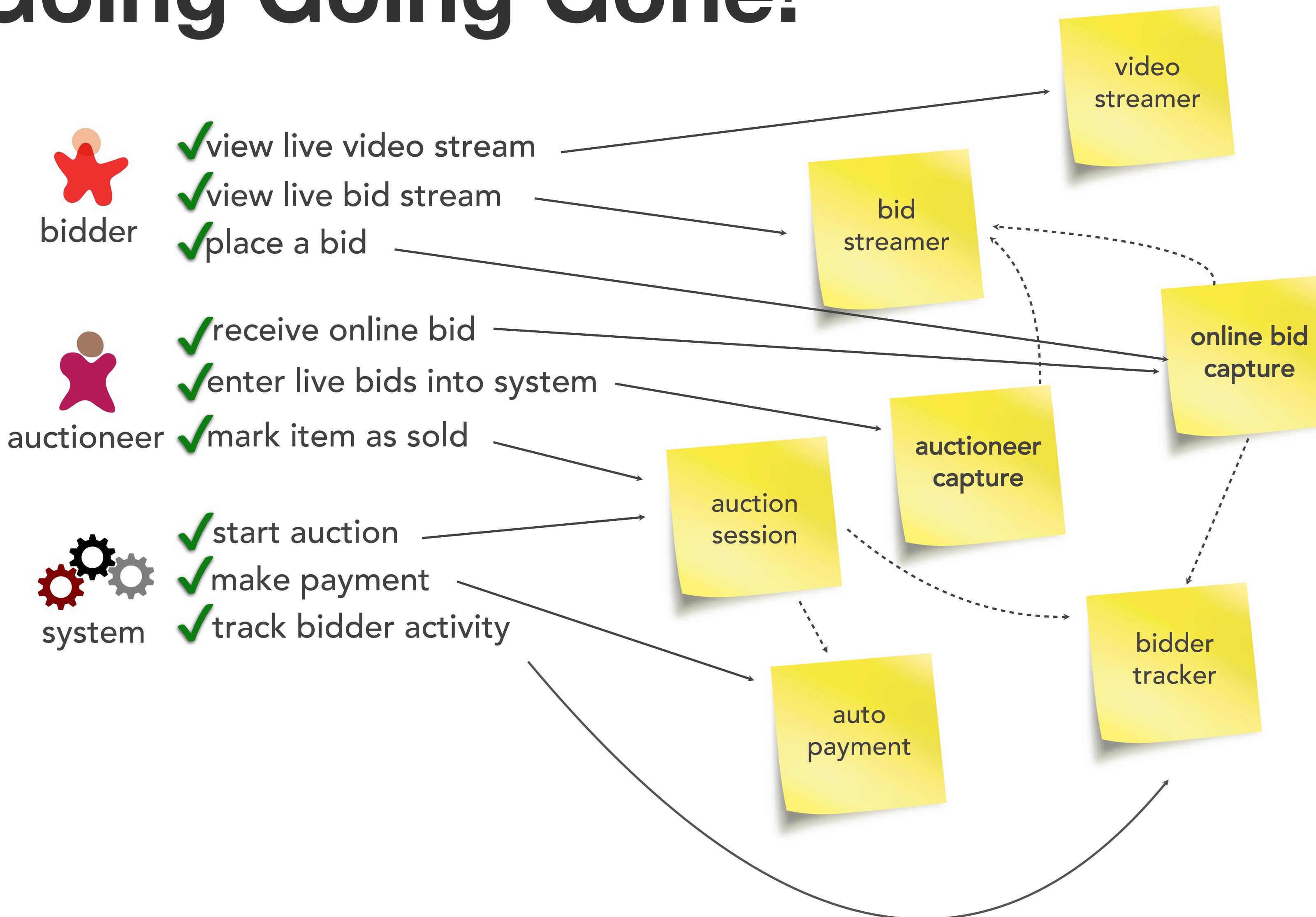
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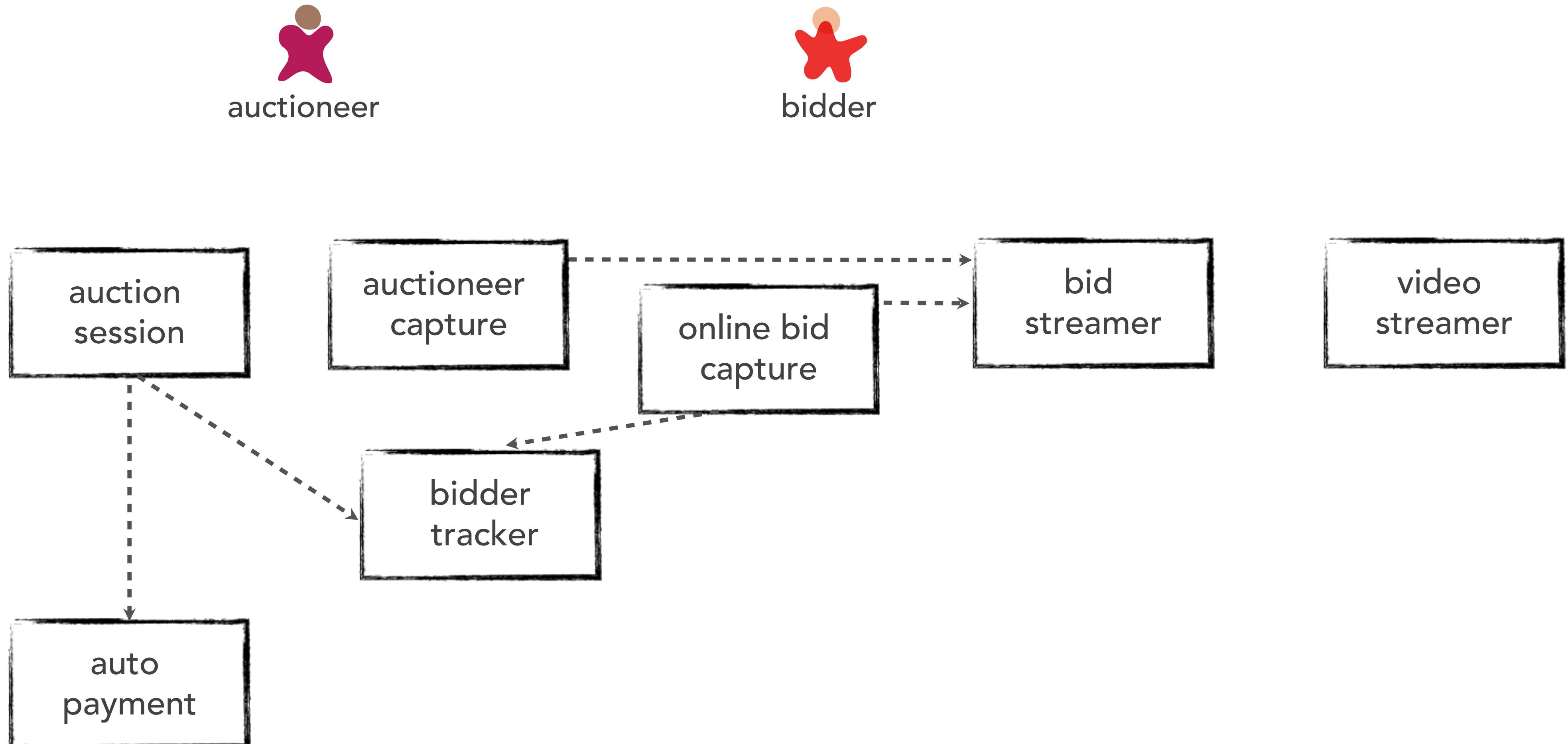
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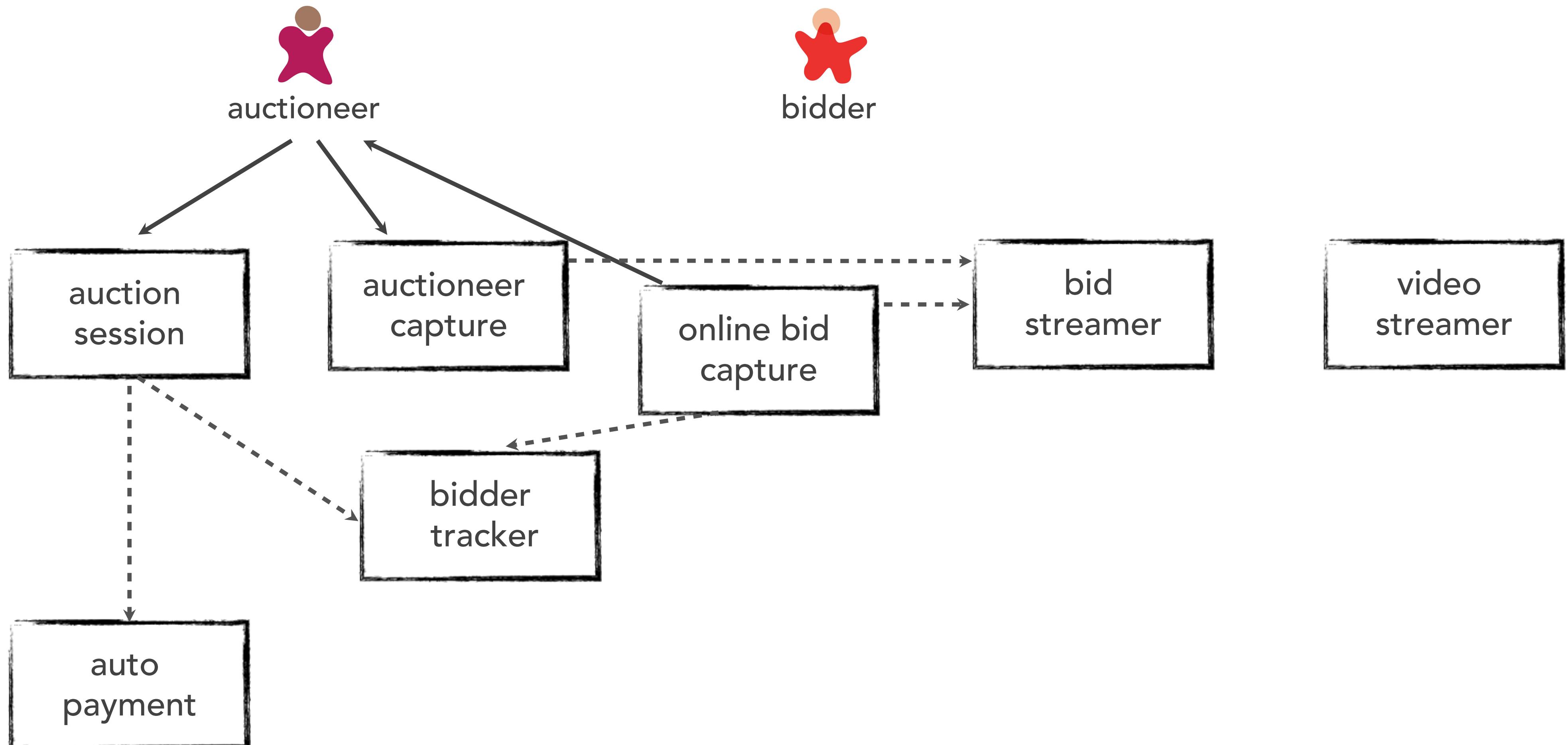
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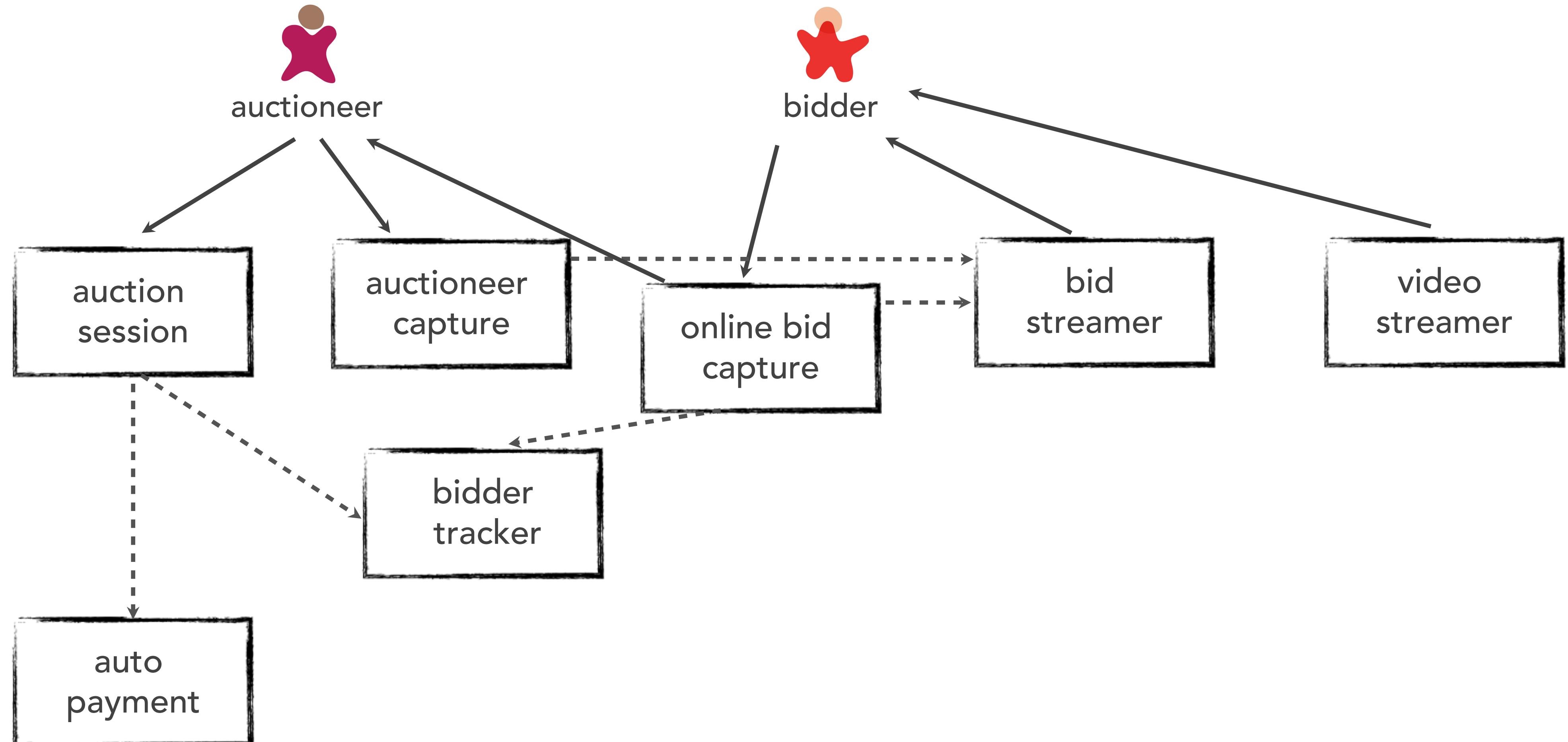
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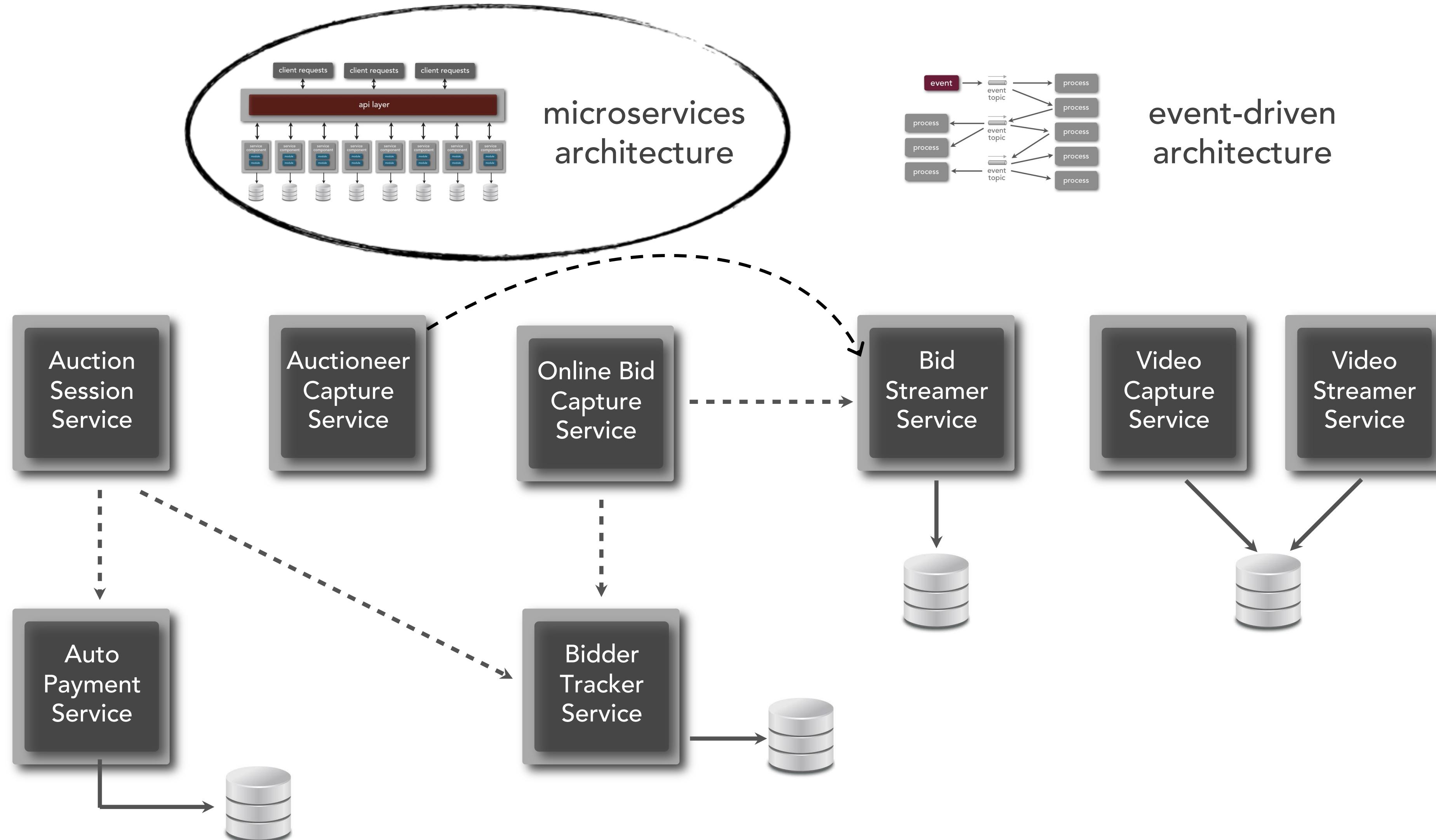
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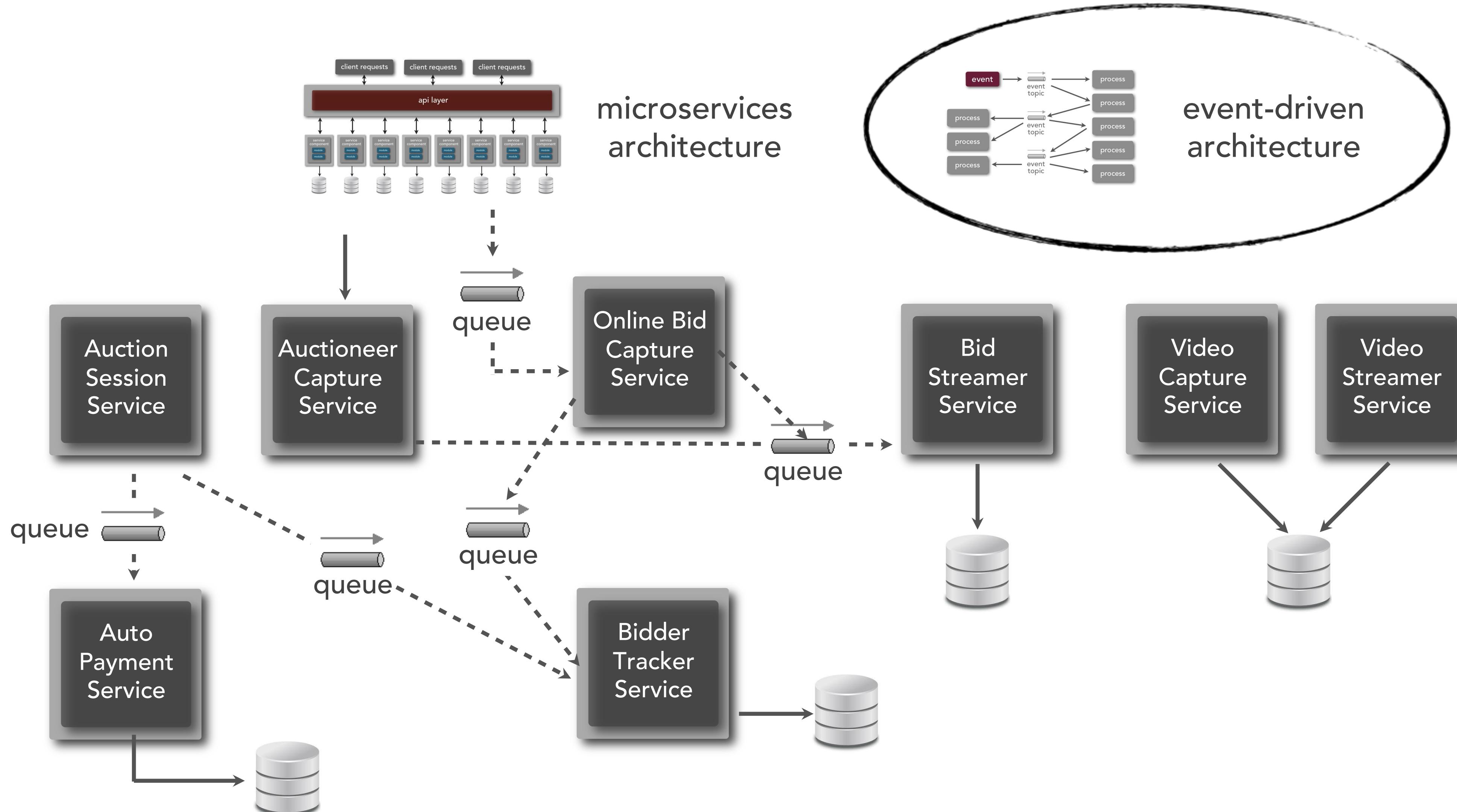
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Your Architectural Kata is...

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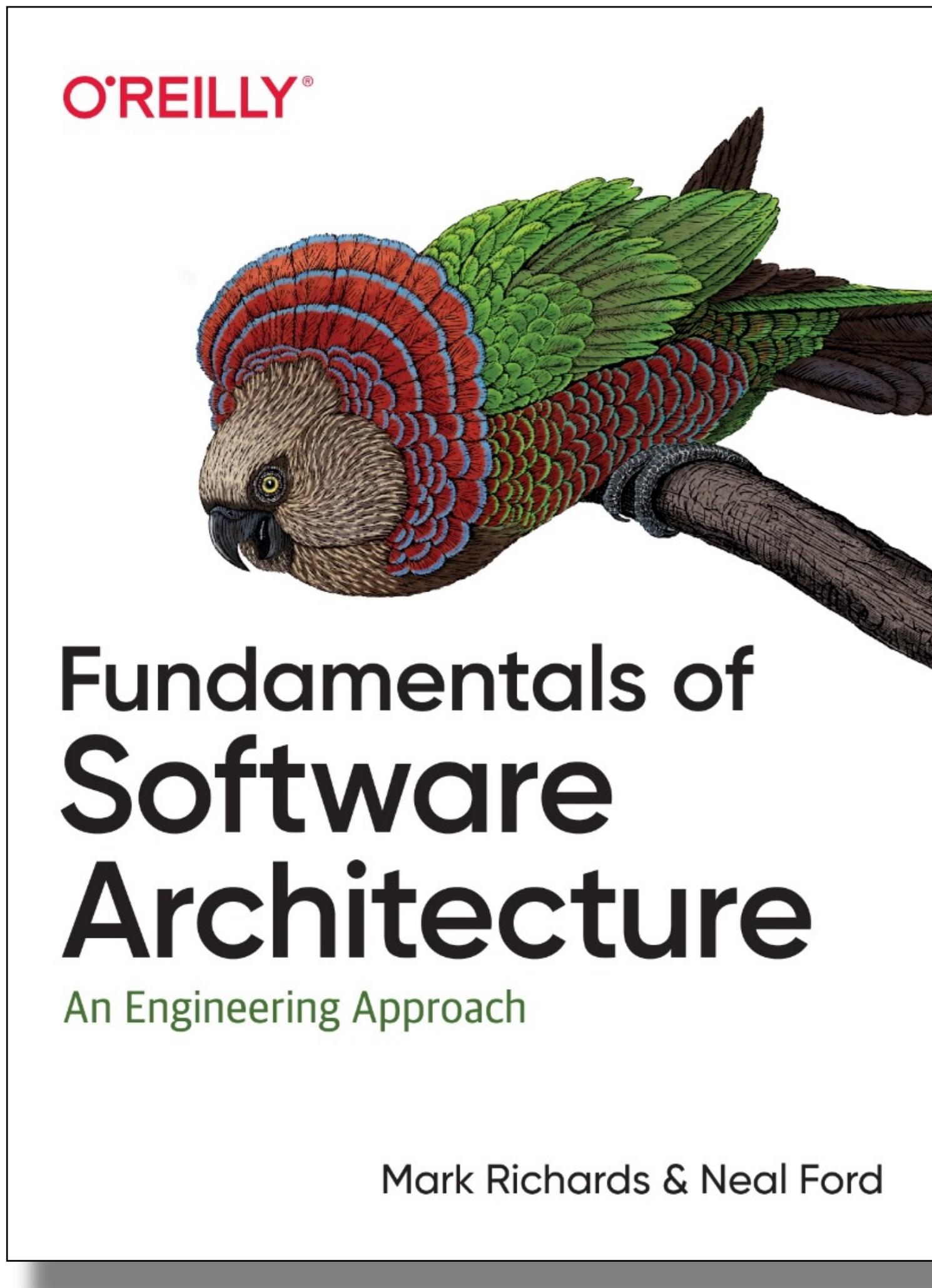
documenting
software
architecture



documenting software architecture



documenting software architecture



Second Law of Software Architecture

"Why is more important than how"

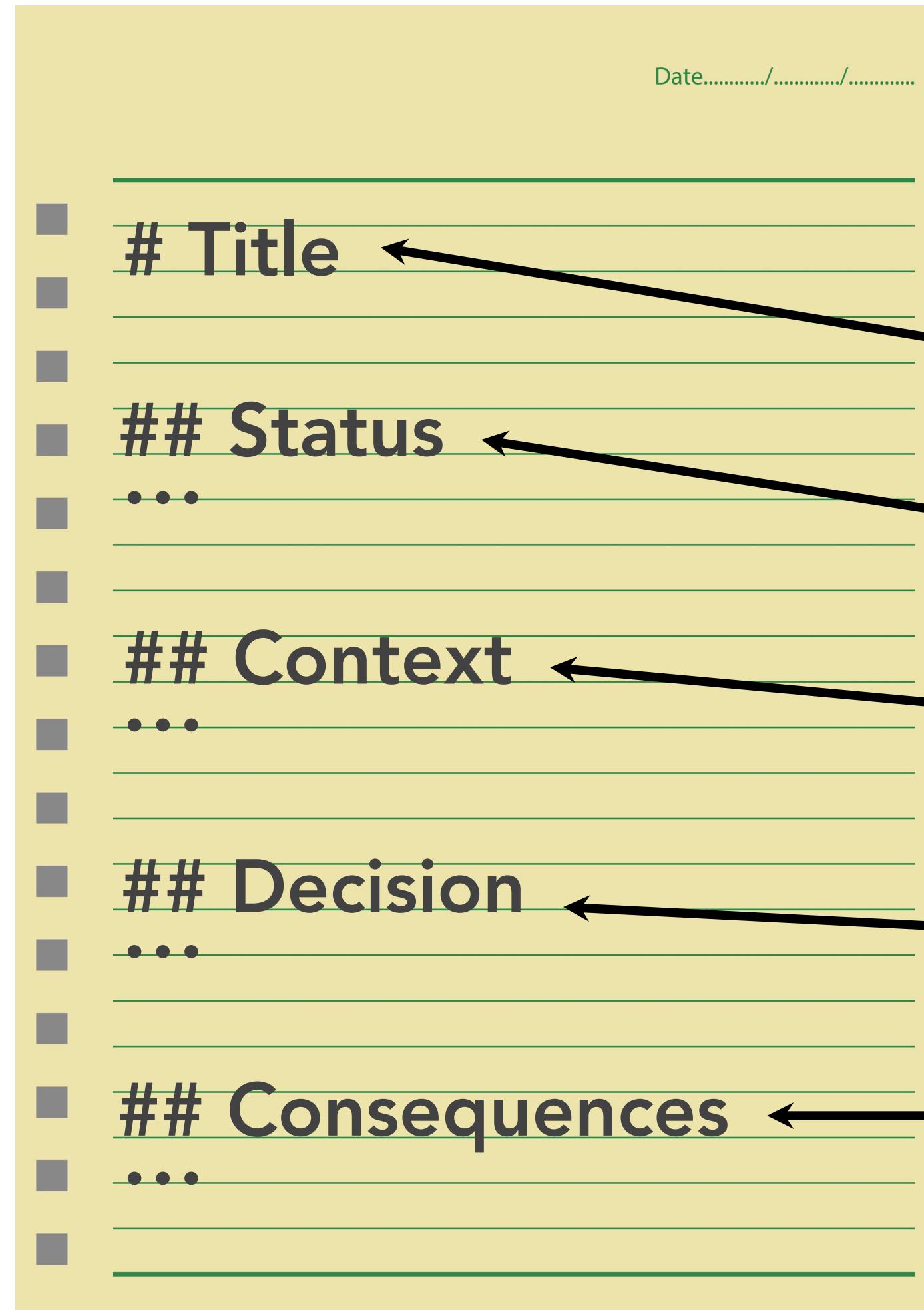
documenting software architecture



“We will keep a collection of records for *architecturally significant decisions*: those that affect the structure, non-functional characteristics, dependencies, interfaces, or construction techniques.”

- Michael Nygard

documenting software architecture



short text file; 1-2 pages long, one file per decision
markdown, textile, asciidoc, plaintext, etc.

short noun phrase

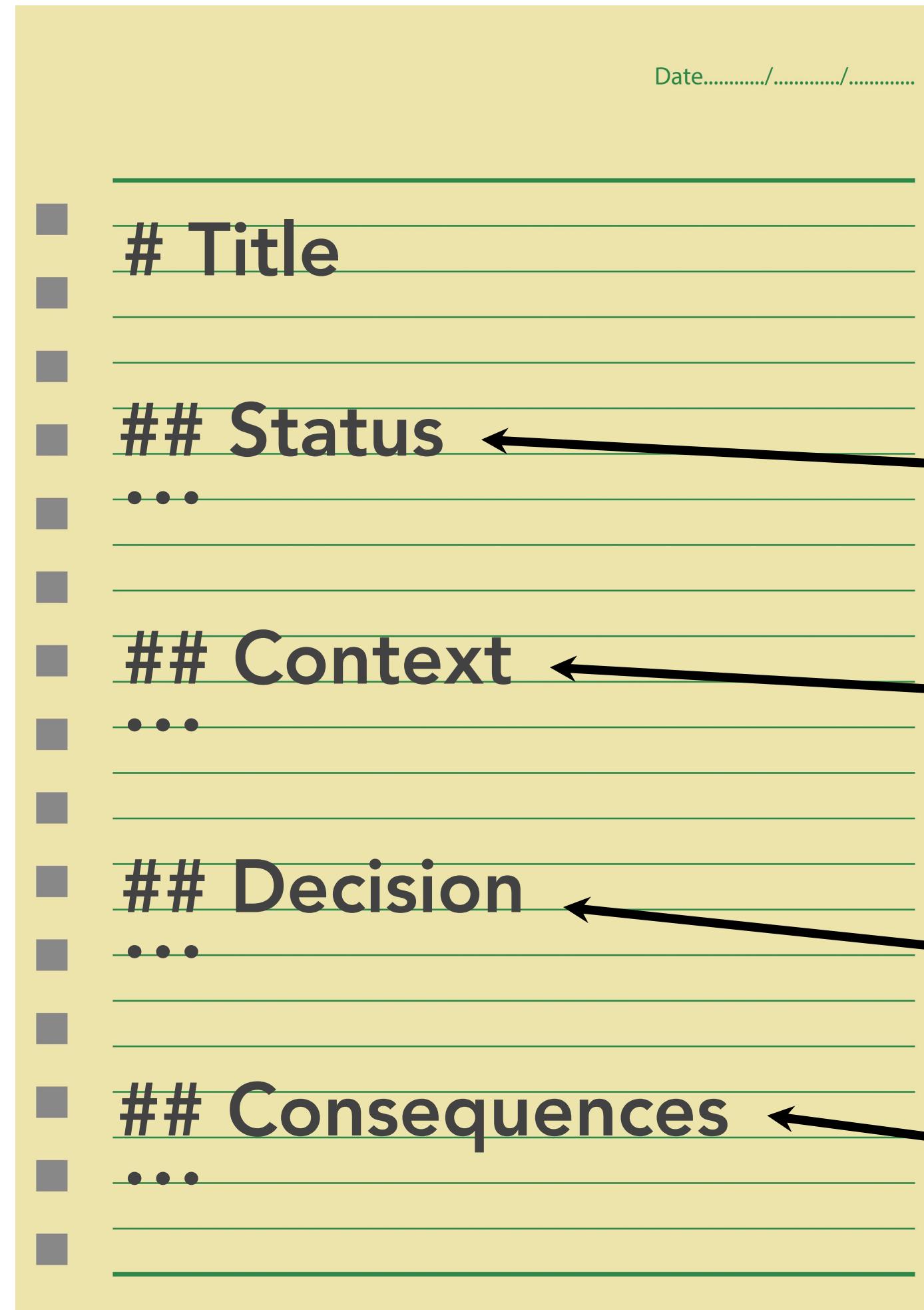
proposed, accepted, superseded

forces at play

response to forces

context after decision is applied

documenting software architecture



short text file; 1-2 pages long, one file per decision
markdown, textile, asciidoc, plaintext, etc.

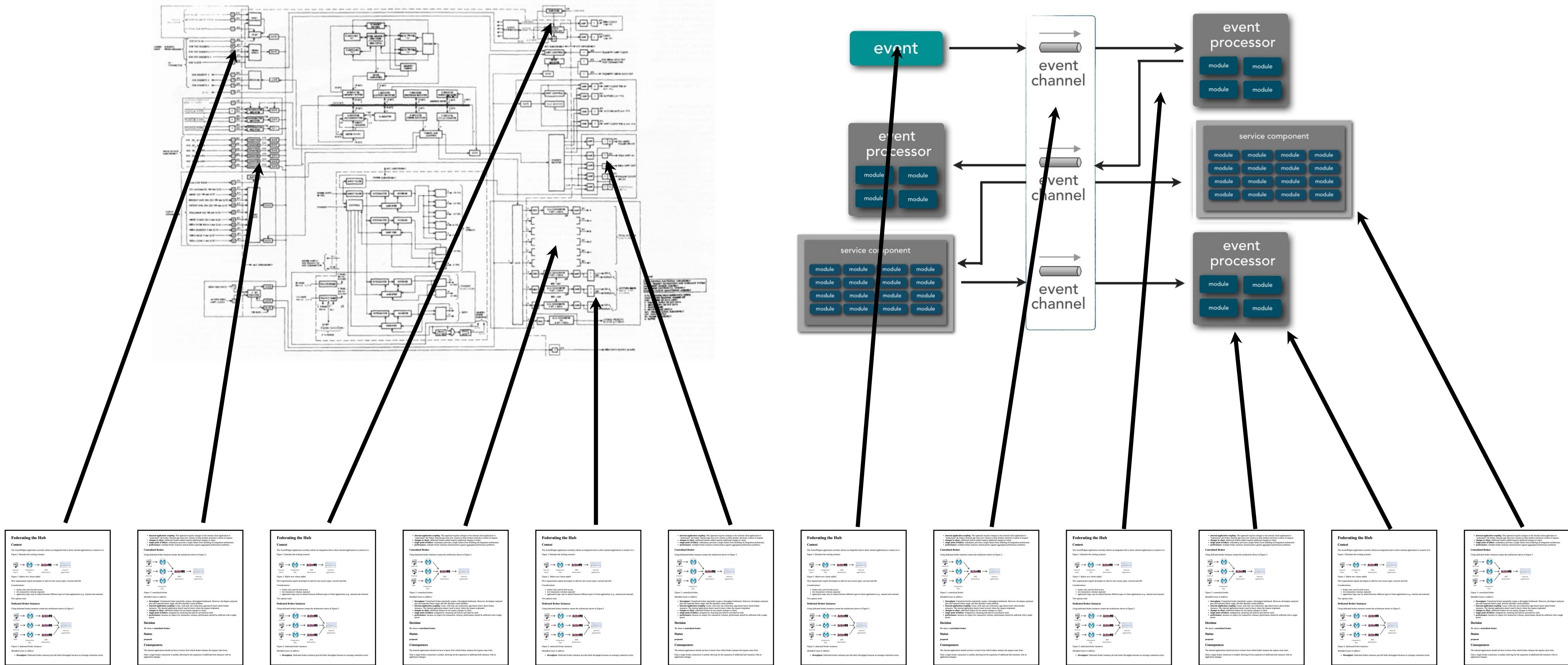
forces criteria for knowing when an architect must seek approval for a decision

description of the problem and alternative solutions available (documentation)

justification (the “why”)

tradeoffs and impact of decision

documenting software architecture



Your Architectural Kata is...

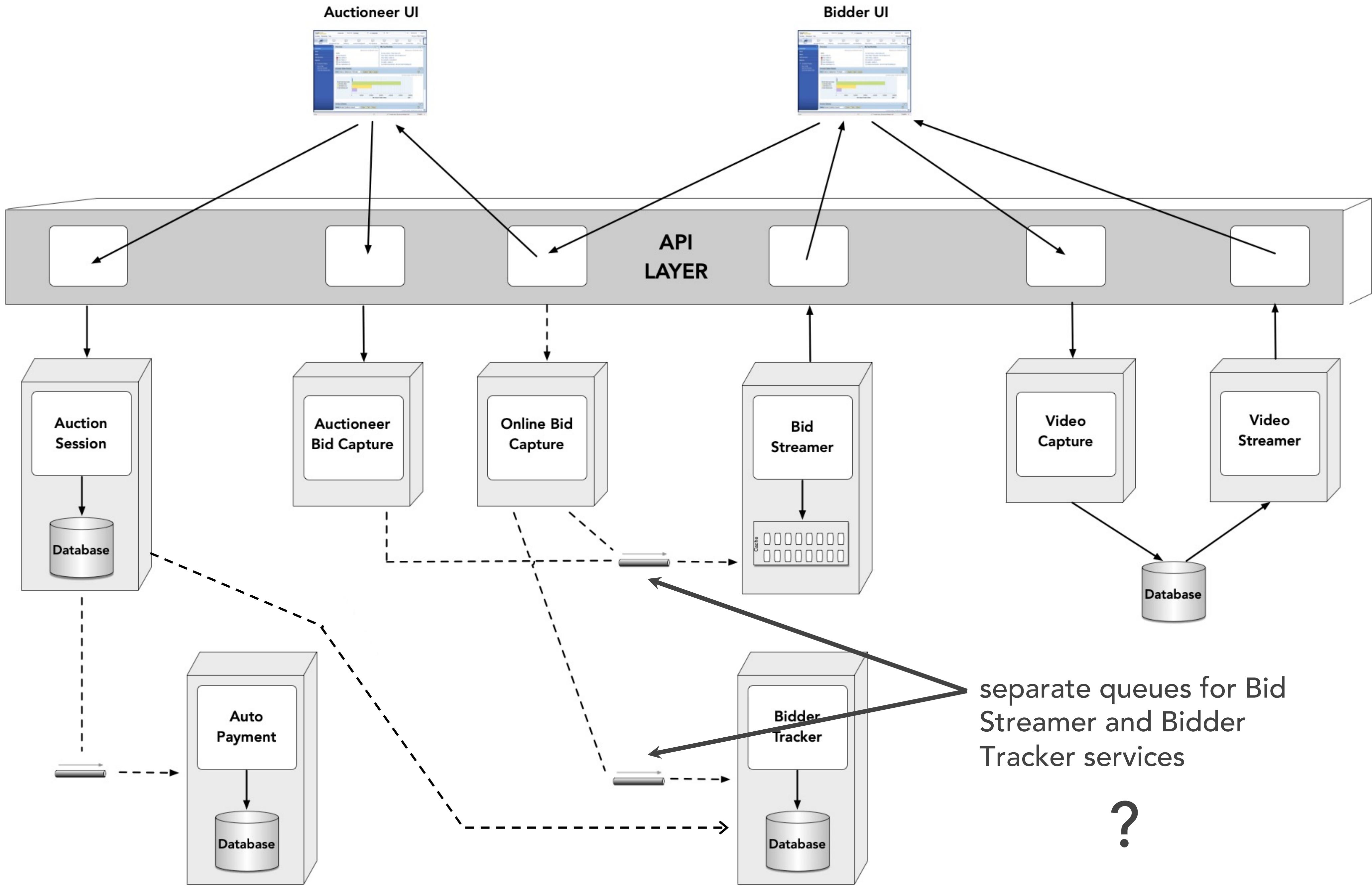
Going Going Gone!

An auction company wants to take their auctions online to a nationwide scale--customers choose the auction to participate in, wait until the auction begins, then bid during the live auction as if they were there in the room, with the auctioneer.

- **Users:** scale up to hundreds of participants (per auction), potentially up to thousands of participants, and as many simultaneous auctions as possible
- **Requirements:**
 - bidders can see a live video stream of the auction and see all bids as they occur
 - auctions must be as real-time as possible
 - both online and live bids must be received in the order in which they are placed
 - bidders register with credit card; system automatically charges card if bidder wins
 - participants must be tracked via a reputation index
- **Additional Context:**
 - auction company is expanding aggressively by merging with smaller competitors
 - if nationwide auction is a success, replicate the model overseas
 - budget is not constrained--this is a strategic direction
 - company just exited a lawsuit where they settled a suit alleging fraud

Your Architectural Kata is...

Going Going Gone!



1. Separate Queues for Bid Streamer and Tracker Services

Status

Accepted

Context

The Bid Capture Services, upon receiving a bid, must forward that bid to the Bid Streamer Service and the Bidder Tracker Service. This could be done using a single topic (pub/sub) or separate queues (p2p) for each service.

Decision

We will use separate queues for the Bid Streamer and Bidder Tracker services.

Multiple bids will come in for the same ask amount. The Streamer service only needs the first bid received for that amount, whereas the Bidder Tracker needs all bids received. Using a topic (pub/sub) would require the Bid Streamer to contain logic to ignore bids that are the same as the prior amount, forcing the Bid Streamer to store shared state between instances.

The Bid Streamer Service stores the bids for an item in an in-memory cache, whereas the Bidder Tracker stored bids in a database. The Bidder Tracker will therefore be slower and might require back pressure. Using a dedicated Bidder Tracker queue provides this dedicated back pressure point.

Consequences

This decision will require the Bid Capture services to send the same information to multiple queues.

Use of Micro-kernel Architecture

Status
PROPOSED

Context

Two key requirements of the system (_promotions_ and _location services_) have both global (affects all stores) and local (specific to location) requirements.

The current design features a modular monolith architecture, allowing individual stores to upload their behavior using JAR files, shown in *Figure 1*.

![modular monolith](fig1_modular_monolith.jpg)
 Figure 1: the current state architecture

Currently, stores must specify custom behavior (product specials, promotions, location exemptions) via a JAR file, uploaded to the global site via FTP. Operations must certify the JAR, leading to delays in deploying new features.

All local customizations reside in one service and in one set of tables in the master database.

To allow stores to most easily add and customize local behavior, the architects propose moving to a micro-kernel architecture, shown in *Figure 2*.

![microkernel architecture](fig2_microkernel.jpg)
 Figure 2: proposed microkernel architecture

The new design allows easy update of global policy (products, inventory, promotions) while allowing local stores to selectively those choices when appropriate.

Decision

The architects decided to migrate the current monolithic architecture to a micro-kernel architecture.

Consequences

The architects take advantage of the restructuring opportunity to localize databases to individual domains.

The new design also incorporates the BFF patterns, discussed in [004 BFF for device independence](#).

The new design will greatly improve the customization workflow.

- the local store plug-in architecture certifies customizations automatically
- promotions within threshold values go live within 15 minutes
- all stores work with generic workflows via the core system
- promotions
- location exemptions
- local products

Use of Micro-kernel Architecture

Status

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Context

Two key requirements of the system (*promotions* and *location services*) have both global (affects all stores) and local (specific to location) requirements. The current design features a modular monolith architecture, allowing individual stores to upload their behavior using JAR files, shown in *Figure 1*.

Figure 1: the current state architecture

Currently, stores must specify custom behavior (product specials, promotions, location exemptions) via a JAR file, uploaded to the global site via FTP. Operations must certify the JAR, leading to delays in deploying new features.

All local customizations reside in one service and in one set of tables in the master database. Over time, as new customizations accrued, it has become a tangled mess.

To allow stores to most easily add and customize local behavior, the architects propose moving to a micro-kernel architecture, shown in *Figure 2*.

Figure 2: proposed microkernel architecture

The new design allows easy update of global policy (products, inventory, promotions) while allowing local stores to selectively those choices when appropriate.

Decision

The architects decided to migrate the current monolithic architecture to become the core system for the new microkernel architecture, and build new functionality via plug-ins.

Consequences

The architects take advantage of the restructuring opportunity to localize databases to individual domains. Communication between services now occurs via messaging.

The new design also incorporates the BFF patterns, discussed in [004 BFF for device independence](#).

The new design will greatly improve the customization workflow.

- the local store plug-in architecture certifies customizations automatically
- promotions within threshold values go live within 15 minutes
- all stores work with generic workflows via the core system, but locations can override to create custom behavior for:
 - promotions
 - location exemptions
 - local products

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PROPOSED

![modu
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Context

Current

All loca Two key requirements of the system (*promotions* and *location services*) have both global (affects all stores) and local (specific to location) requirements.

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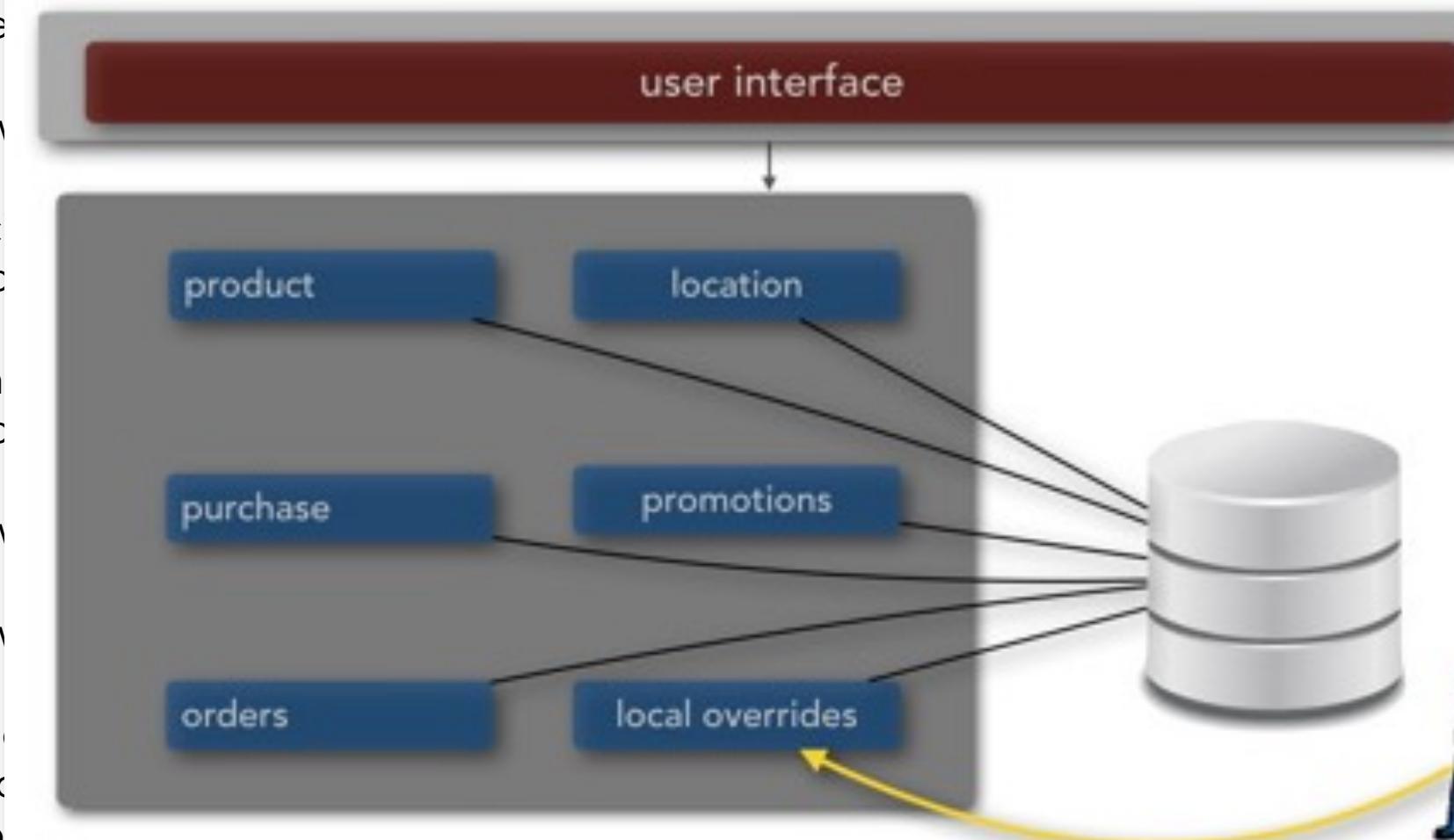


Figure 1: the current state architecture

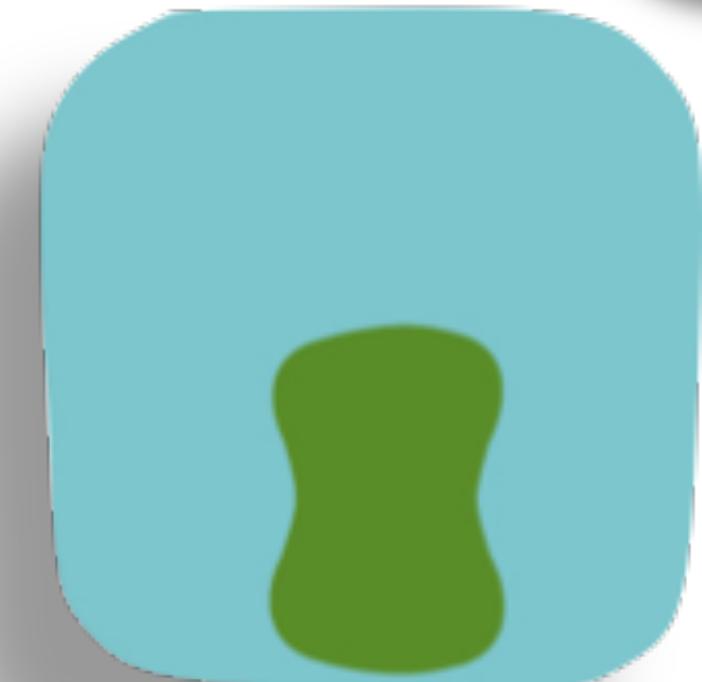
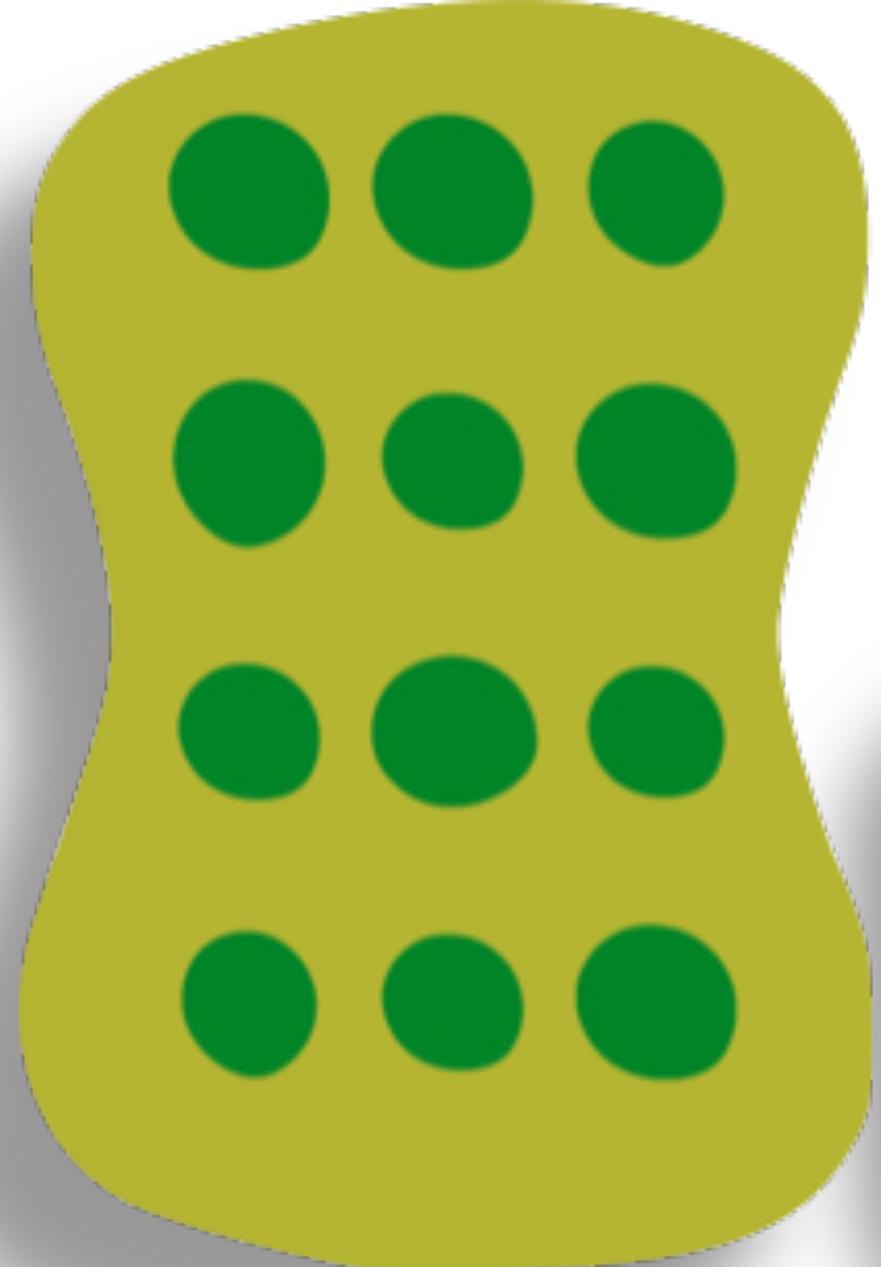
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Meet the Judges!



**Meet the
Client !!**

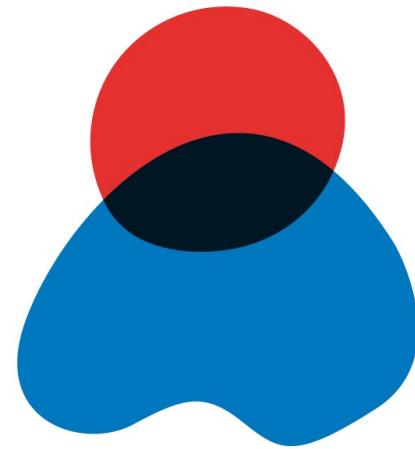


The Sysops Squad

Penultimate Electronics is a large electronics giant that has numerous retail stores throughout the country. When customers buy computers, TV's, stereos, and other electronic equipment, they can choose to purchase a support plan. Customer-facing technology experts (the “Sysops Squad”) will then come to the customers residence (or work office) to fix problems with the electronic device.

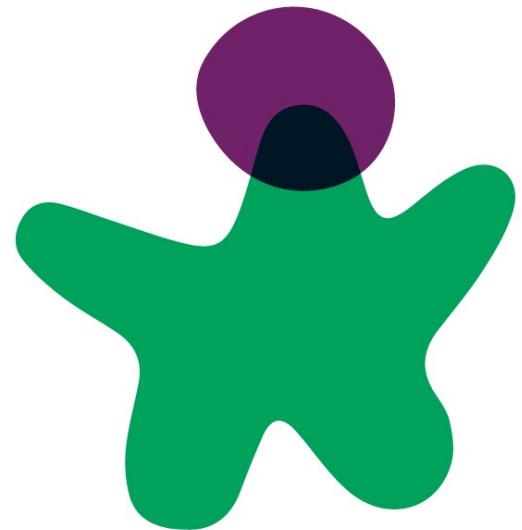


Four Main Sysop Squad Users



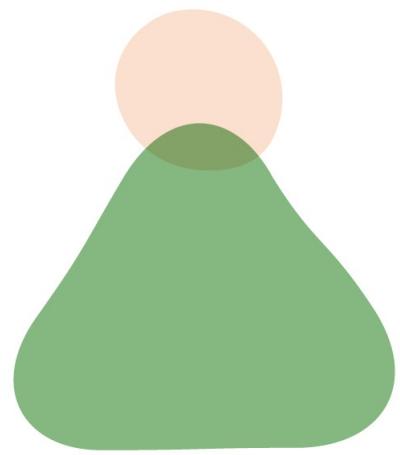
The administrator user maintains the internal users of the system, including the list of experts and their corresponding skillset, location, and availability. The administrator also manages all of the billing processing for customers using the system, and maintains static reference data (such as supported products, name-value pairs in the system, and so on).

Four Main Sysop Squad Users



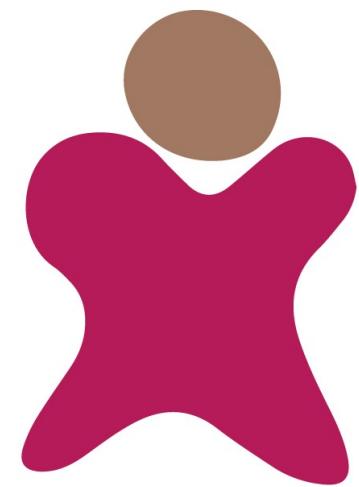
The customer registers for the Sysops Squad service, maintains their customer profile, support contracts, and billing information. Customers enter problem tickets into the system, and also fill out surveys after the work has been completed.

Four Main Sysop Squad Users



Experts are assigned problem tickets and fix problems based on the ticket. They also interact with the knowledge base to search for solutions to customer problems and also enter notes about repairs.

Four Main Sysop Squad Users



The manager keeps track of problem ticket operations and receives operational and analytical reports about the overall Sysops Squad problem ticket system.

Non-ticket Workflow

The manager keeps track of problem ticket operations and receives operational and analytical reports about the overall Sysops Squad problem ticket system.

- Sysops Squad experts are added and maintained in the system through an administrator, who enters in their locale, availability, and skills.
- Customers register with the Sysops Squad system and have multiple support plans based on the products they purchased.
- Customers are automatically billed monthly based on credit card information contained in their profile. Customers can view billing history and statements through the system.
- Managers request and receive various operational and analytical reports, including financial reports, expert performance reports, and ticketing reports.

Ticketing Workflow

The ticketing workflow starts when a customer enters a problem ticket into the system, and ends when the customer completes the survey after the repair is done. This workflow is outlined as follows:

- Customers who have purchased the support plan enter a problem ticket using the Sysops Squad website.
- Once a problem ticket is entered in the system, the system then determines which Sysops Squad expert would be the best fit for the job based on skills, current location, service area, and availability (free or currently on a job).
- Once assigned, the problem ticket is uploaded to a dedicated custom mobile app on the Sysops Squad expert's mobile device. The expert is also notified via a text message that they have a new problem ticket.

Ticketing Workflow

- The customer is notified through an SMS text message or email (based on their profile preference) that the expert is on their way.
- The expert uses the custom mobile application on their phone to retrieve the ticket information and location. The sysops squad expert can also access a knowledge base through the mobile app to find out what things have been done in the past to fix the problem.
- Once the expert fixes the problem, they mark the ticket as “complete”. The sysops squad expert can then add information about the problem and repair information to the knowledge base.
- After the system receives notification that the ticket is complete, the system send an email to the customer with a link to a survey which the customer then fills out.
- The system receives the completed survey from the customer and records the survey information.

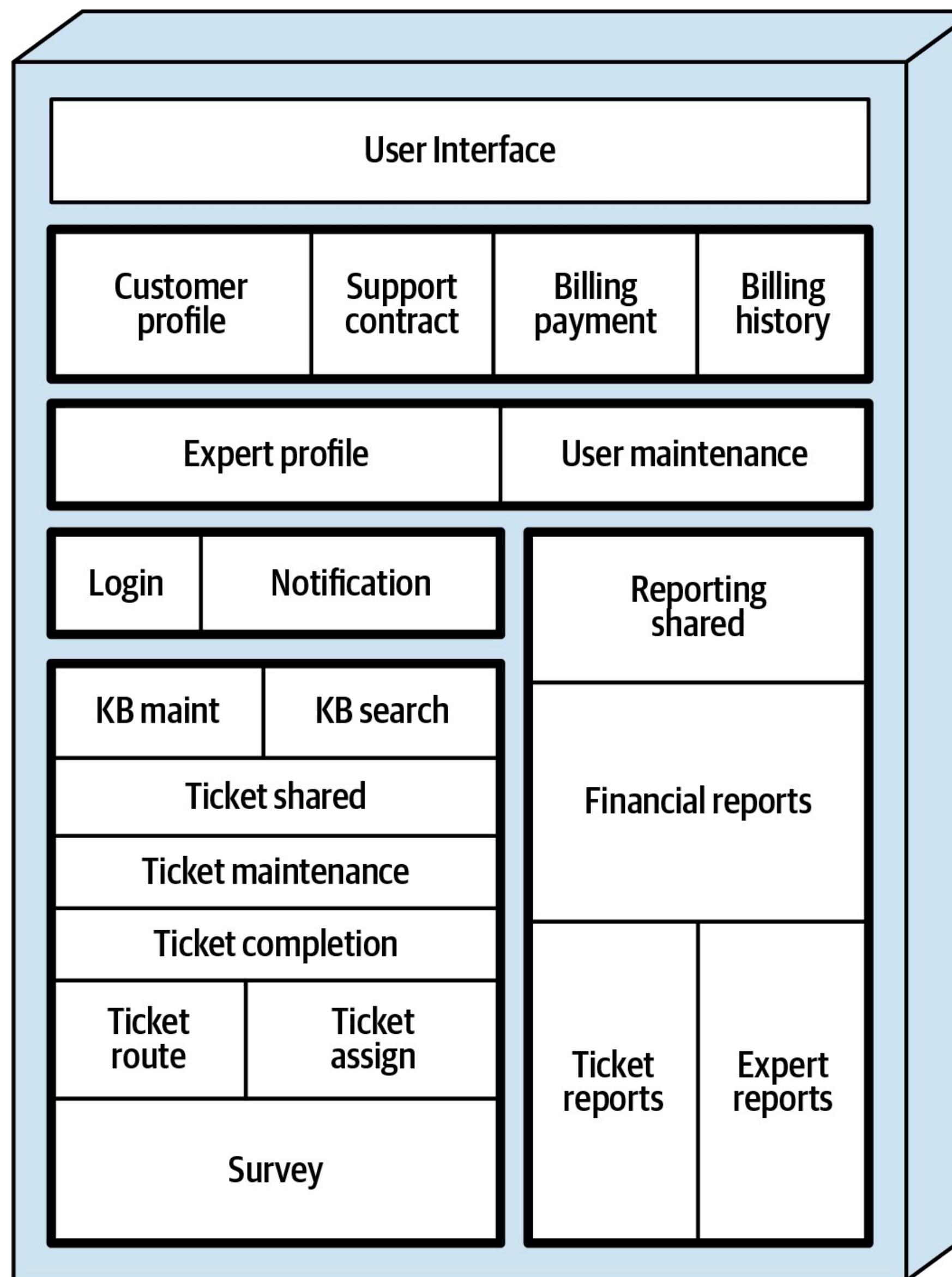
Sysops Squad - A Bad Situation...

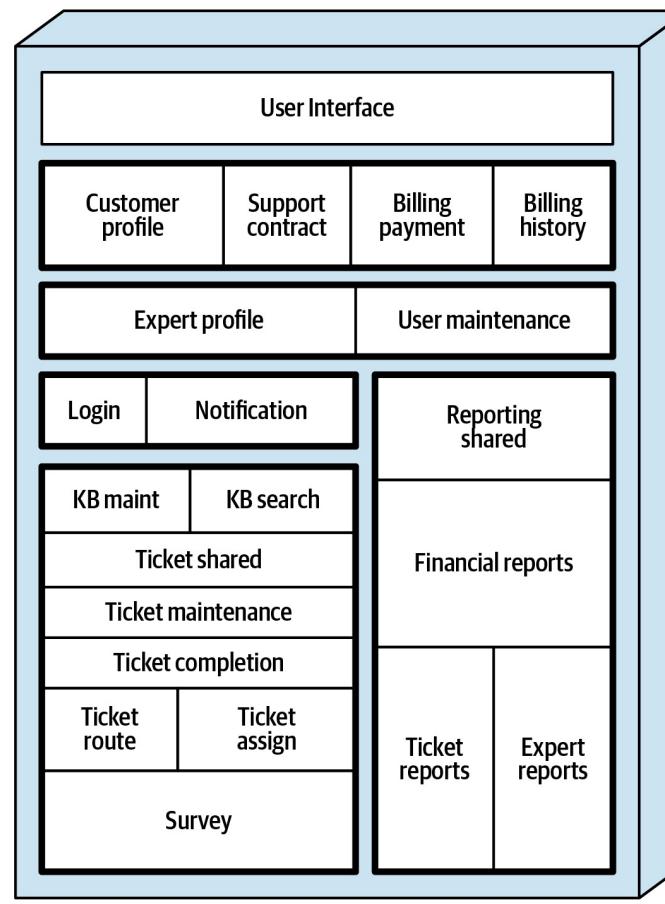
Things have not been good with the Sysops Squad lately. The current trouble ticket system is a large monolithic application that was developed many years ago. Customers are complaining that consultants are never showing up due to lost tickets, and often times the wrong consultant shows up to fix something they know nothing about. Customers and call-center staff have been complaining that the system is not always available for web-based or call-based problem ticket entry. Change is difficult and risky in this large monolith - whenever a change is made, it takes too long and something else usually breaks. Due to reliability issues, the monolithic system frequently “freezes up” or crashes - they think it’s mostly due a spike in usage and the number of customers using the system. If something isn’t done soon, Penultimate Electronics will be forced to abandon this very lucrative business line and fire all of the experts (including you, the architect).

Current process in the monolithic system:

1. Sysops squad experts are added and maintained in the system through an administrator, who enters in their locale, availability, and skills.
2. Customers who have purchased the support plan can enter a problem ticket using the sysops squad website. Customer registration for the support service is part of the system. The system bills the customer on an annual basis when their support period ends by charging their registered credit card.
3. Once a trouble ticket is entered in the system, the system then determines which sysops squad expert would be the best fit for the job based on skills, current location, service area, and availability (free or currently on a job).
4. The sysops squad expert is then notified via a text message that they have a new ticket. Once this happens an email or SMS text message is sent to the customer (based on their profile preference) that the expert is on their way.
5. The sysops squad expert then uses a custom mobile application on their phone to access the ticketing system to retrieve the ticket information and location. The sysops squad expert can also access a knowledge base through the mobile app to find out what things have been done in the past to fix the problem.
6. Once the sysops squad expert fixes the problem, they mark the ticket as “complete”. The sysops squad expert can then add information about the problem and fix to the knowledge base.
7. After the system receives notification that the ticket is complete, the system send an email to the customer with a link to a survey which the customer then fills out.

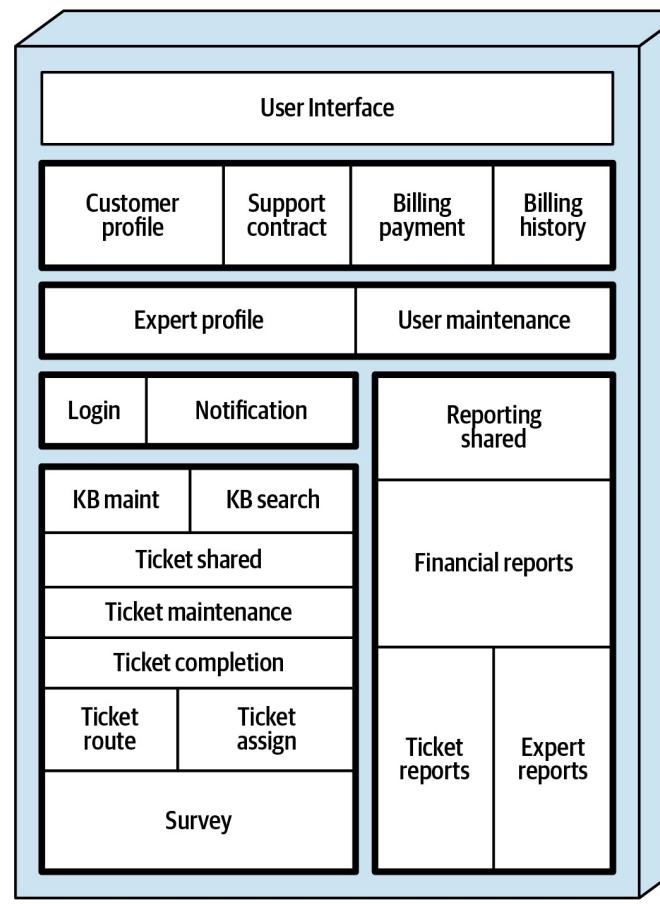
Architecture Components





Existing Components

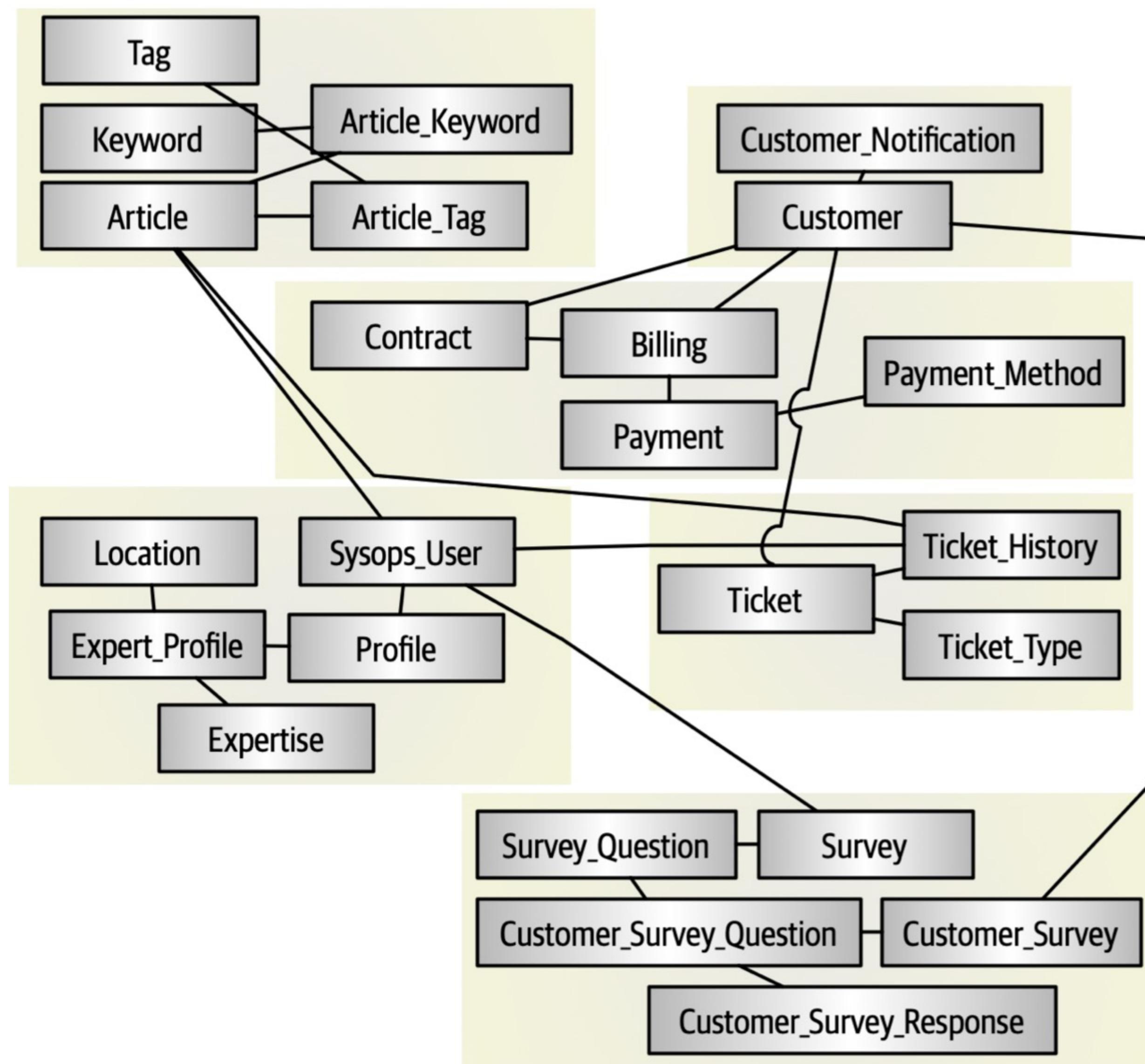
Component	Namespace	Responsibility
Login	ss.login	Internal user and customer login and security logic
Billing payment	ss.billing.payment	Customer monthly billing and customer credit card info
Billing history	ss.billing.history	Payment history and prior billing statements
Customer notification	ss.customer.notification	Notify customer of billing, general info
Customer profile	ss.customer.profile	Maintain customer profile, customer registration
Expert profile	ss.expert.profile	Maintain expert profile (name, location, skills, etc.)
KB maint	ss.kb.maintenance	Maintain and view items in the knowledge base
KB search	ss.kb.search	Query engine for searching the knowledge base
Reporting	ss.reporting	All reporting (experts, tickets, financial)



Existing Components

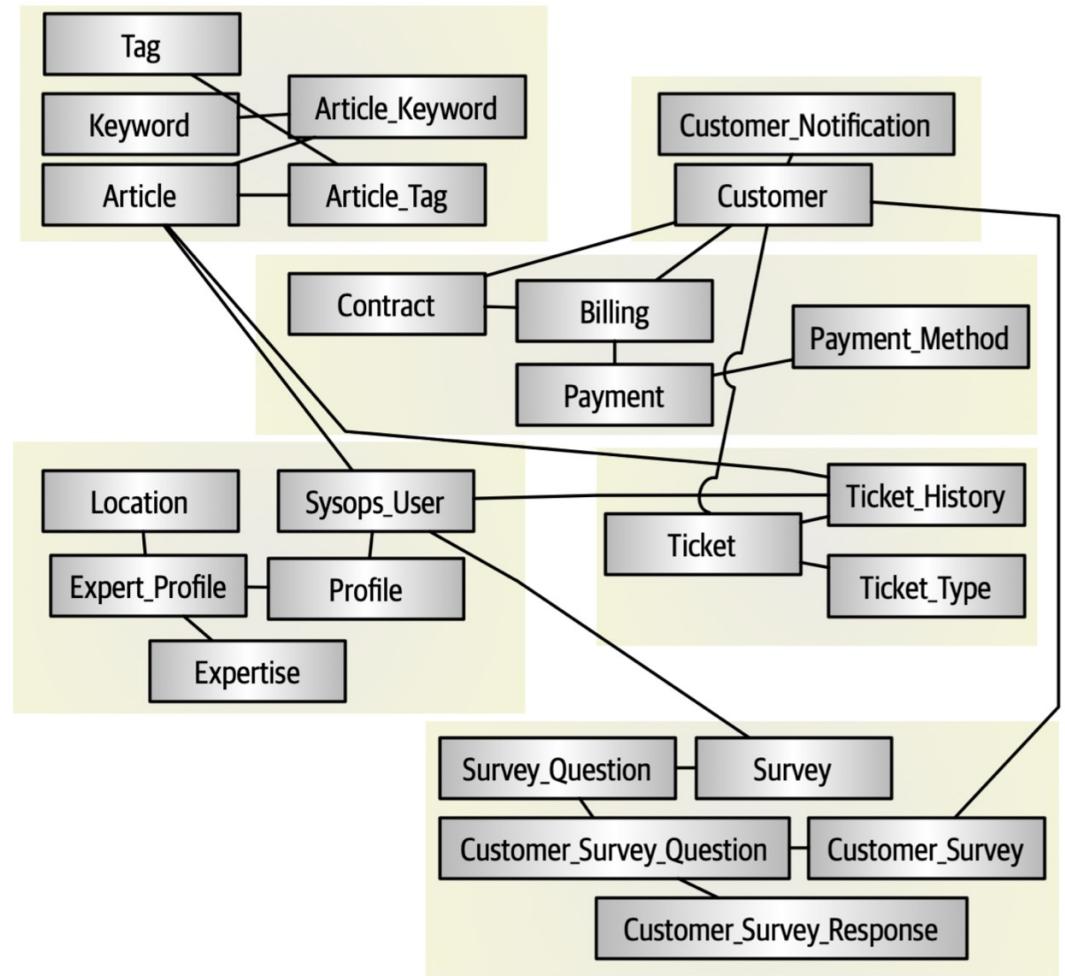
Component	Namespace	Responsibility
Ticket	ss.ticket	Ticket creation, maintenance, completion, common code
Ticket assign	ss.ticket.assign	Find an expert and assign the ticket
Ticket notify	ss.ticket.notify	Notify customer that the expert is on their way
Ticket route	ss.ticket.route	Sends the ticket to the experts mobile device app
Support contract	ss.supportcontract	Support contracts for customers, products in the plan
Survey	ss.survey	Maintain surveys, capture and record survey results
Survey notify	ss.survey.notify	Send survey email to customer
Survey templates	ss.survey.templates	Maintain various surveys based on type of service
User maintenance	ss.users	Maintain internal users and roles

Existing Tables



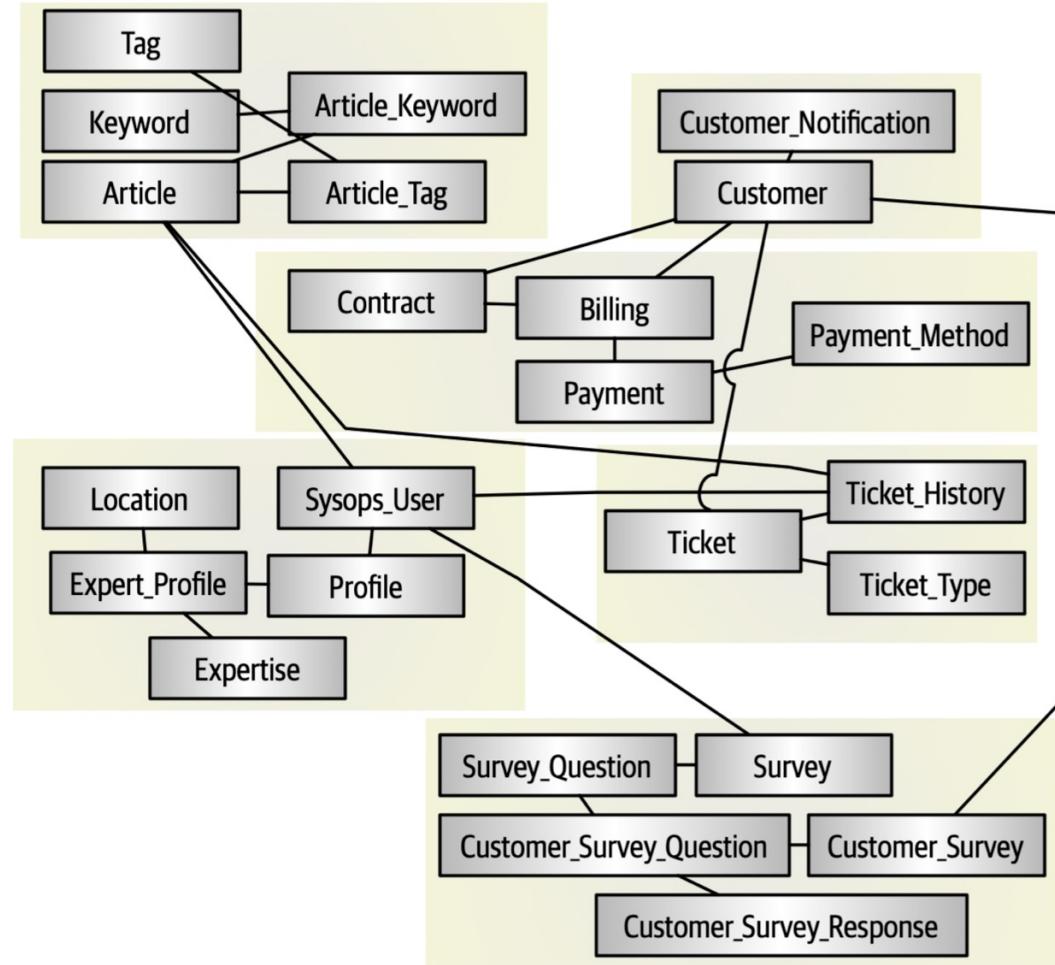
Tables in the Sysops database (tables & views omitted for brevity)

Existing Tables



Tables in the Sysops database (tables & views omitted for brevity)

Table	Responsibility
Customer	Entities needing Sysops support
Customer_Notification	Notification preferences for customers
Survey	A survey for after support customer satisfaction
Survey_Question	Questions in a survey
Customer_Survey	Survey is assigned to customer
Customer_Survey_Question	Survey question is assigned to customer
Customer_Survey_Response	A customers response to survey
Billing	Billing information for support contract
Contract	A contract between an entity and Sysops for support
Payment_Method	Payment methods supported for making payment



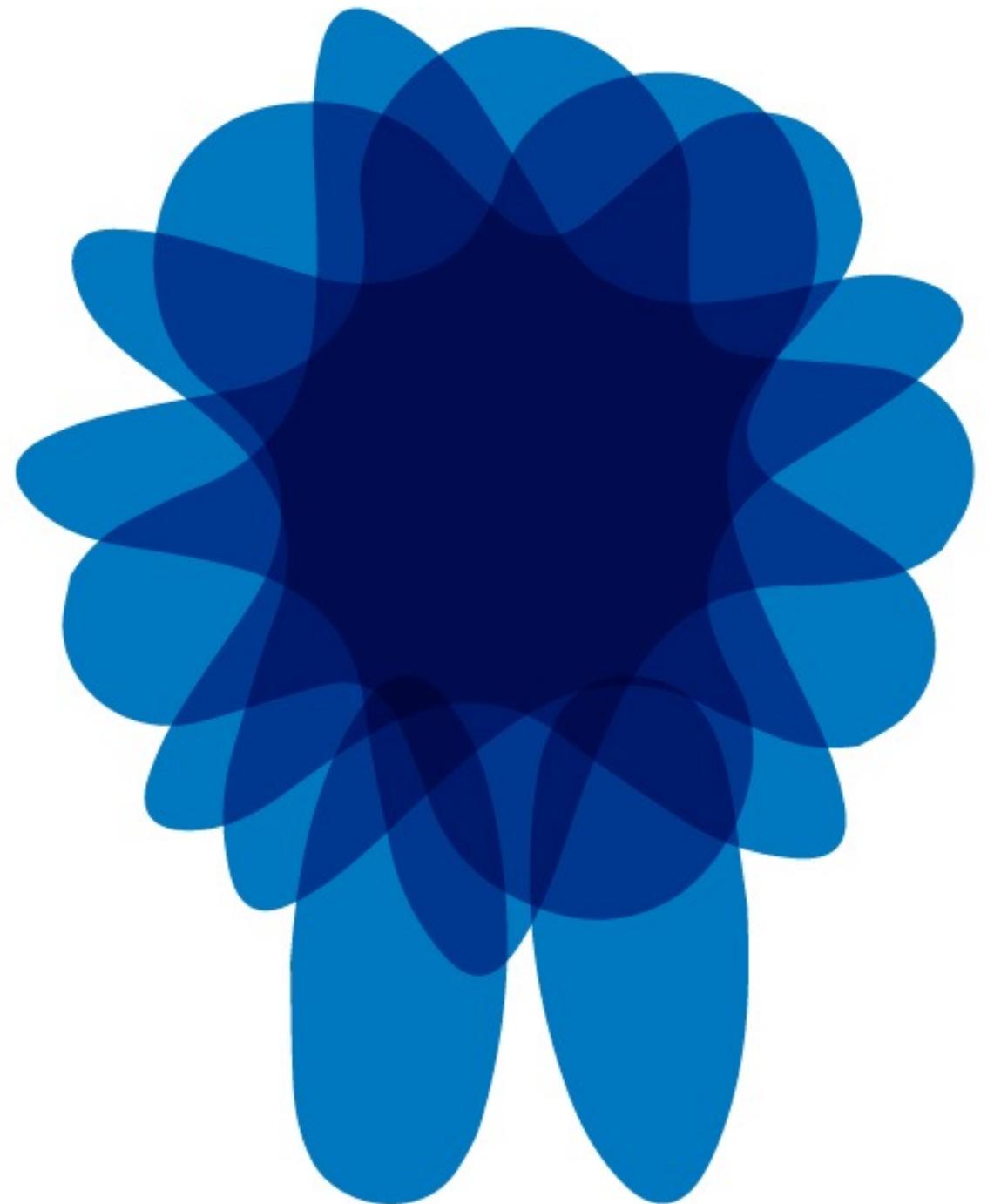
Existing Tables

Table	Responsibility
Payment	Payments processed for billings
SysOps_User	The various users in Sysops
Profile	Profile information for Sysops users
Expert_Profile	Profiles of experts
Expertise	Various expertise within Sysops
Location	Locations served by the expert
Article	Articles for the knowledge base
Tag	Tags on Articles
Keyword	Keyword for a Article
Article_Tag	Tags associated to Articles
Article_Keyword	Join table for Keywords and Articles
Ticket	Support tickets raised by customers
Ticket_Type	Different types of tickets
Ticket_History	The history of support tickets

Some Things to Think About

- Customer registration—customers register on the site and provide their profile information, billing information (credit card), and what products they purchased that they would like to have covered (support plan).
- Administration activities—admin staff maintain internal user accounts, query ticket status via a “help desk” when customers call for status, and maintain various reference data
- Managers can run reports, including various ticketing reports, expert performance reports, and financial reports

Meet the
Criteria!



Judges Criteria



Clarity of narrative, organization, and supporting documentation



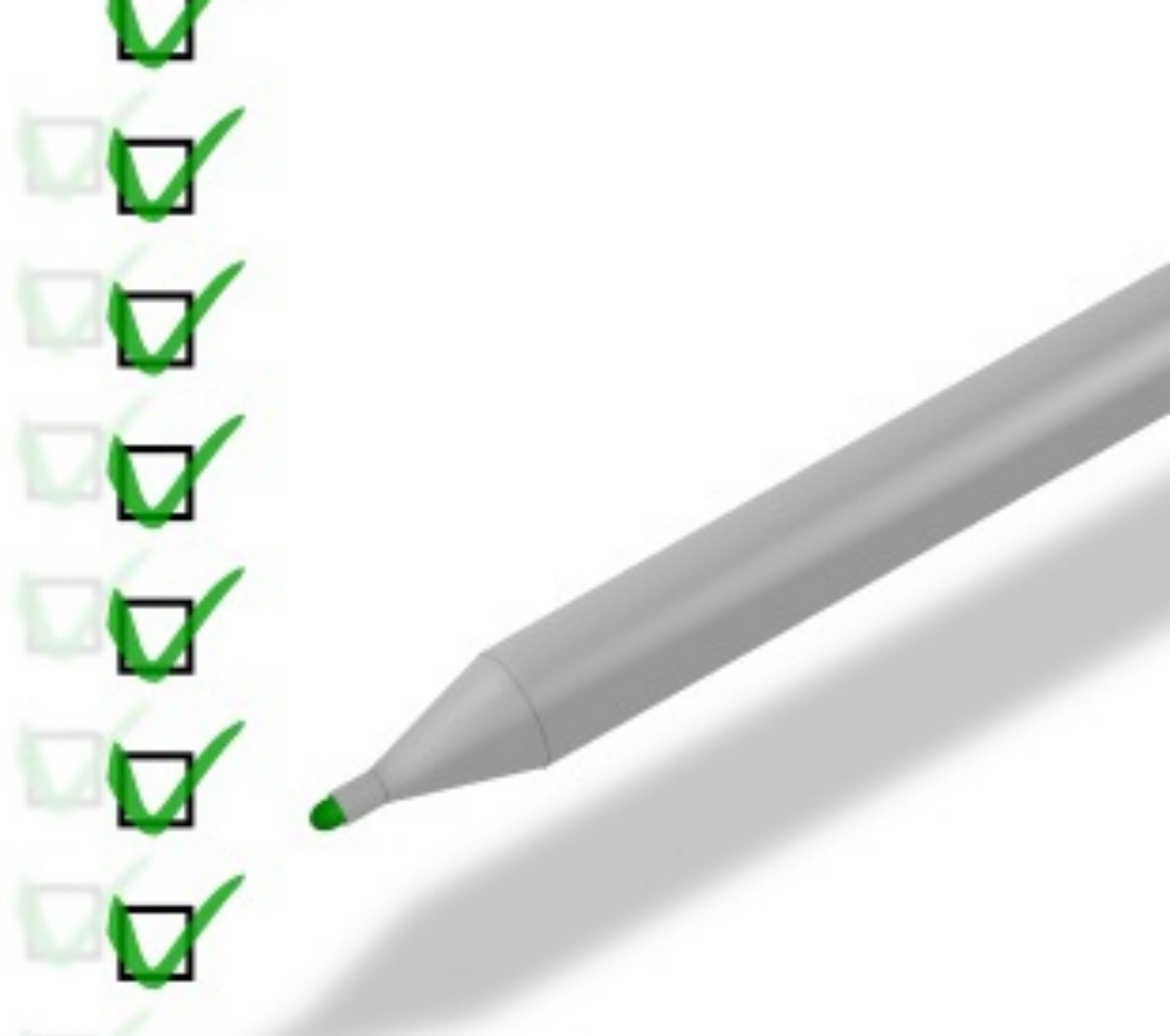
**Understanding of
the requirements
and completeness
of solution**



Identification of supporting architecture characteristics



Diagrams - types, level of detail, and completeness



Architecture decision records - documentation and justification



Overall systems architecture



Logistics and details

Q&A

Go forth & do some
architecture!

