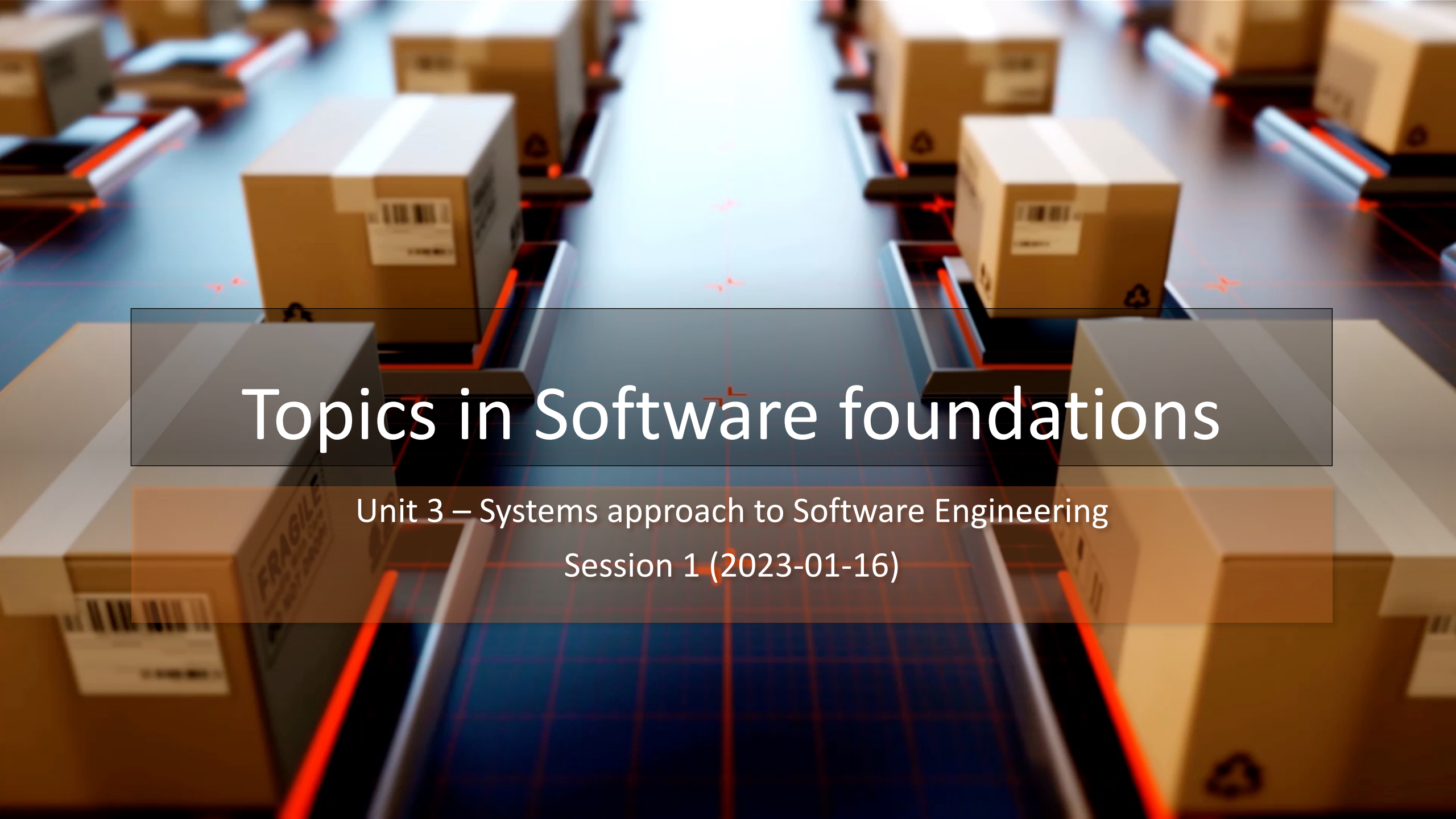


Topics in Software foundations

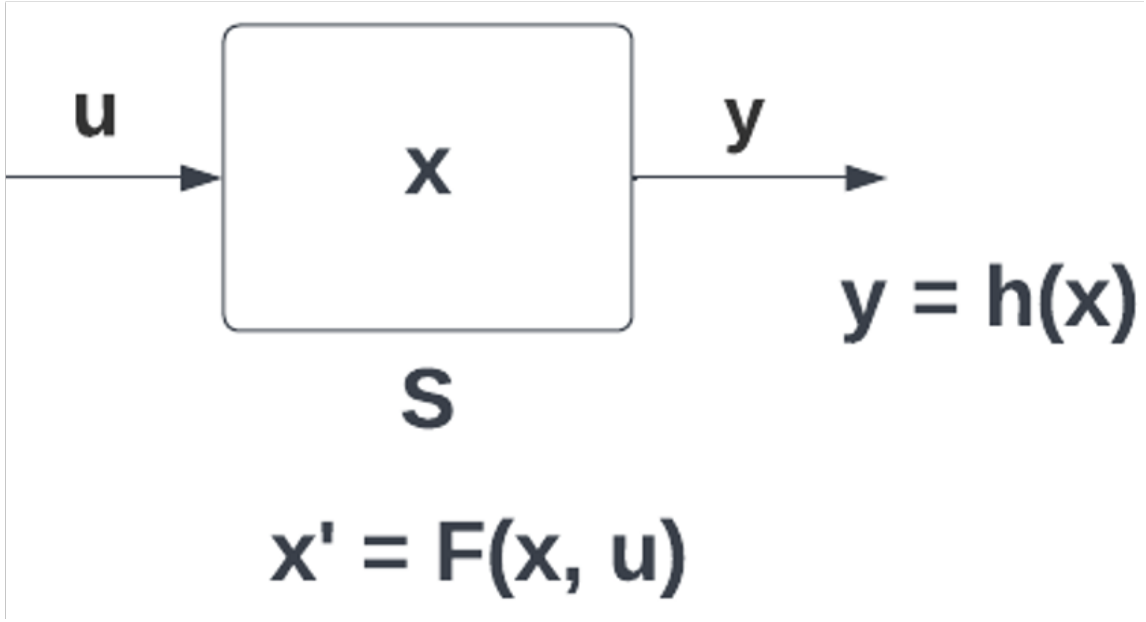
Unit 3 – Systems approach to Software Engineering

Session 1 (2023-01-16)

Recap: Transition Systems

A transition System is a tuple $(X, X^0, U, \rightarrow, Y, h)$ where

1. X is a **state space**, a set of **states**.
2. X^0 is a subset of X and is the set of **initial states**.
3. U is an **action space**, a set of **actions**.
4. Y is an **observation space**, a set of **observations**.
5. $h : X \rightarrow Y$, called the **display** maps states to observations.
6. $\rightarrow \subseteq X \times U \times X$ is called the **transition relation** or **dynamics**. The transition (x, u, x') is written $x \xrightarrow{u} x'$.



Recap: Iterative Systems

Special case of transition systems where U is a singleton (“NEXT” is the only action)

Note the similarity of such a system with the Discrete Flow (X,F) in Mapcode

What does a software engineer do in a software product company?

Your perspective

What does a software engineer do in a software product company?

Class discussion

Imagine that you can see future ☺

You have been seeing yourself perform in your first company after college – first 6-9 months of your work.

Answer the following questions based on what you see.

Questions

What skills and courses (that you learned in college days) are helping you the most?

What skills your manager expected you to have but you didn't have (or had less than expected)?

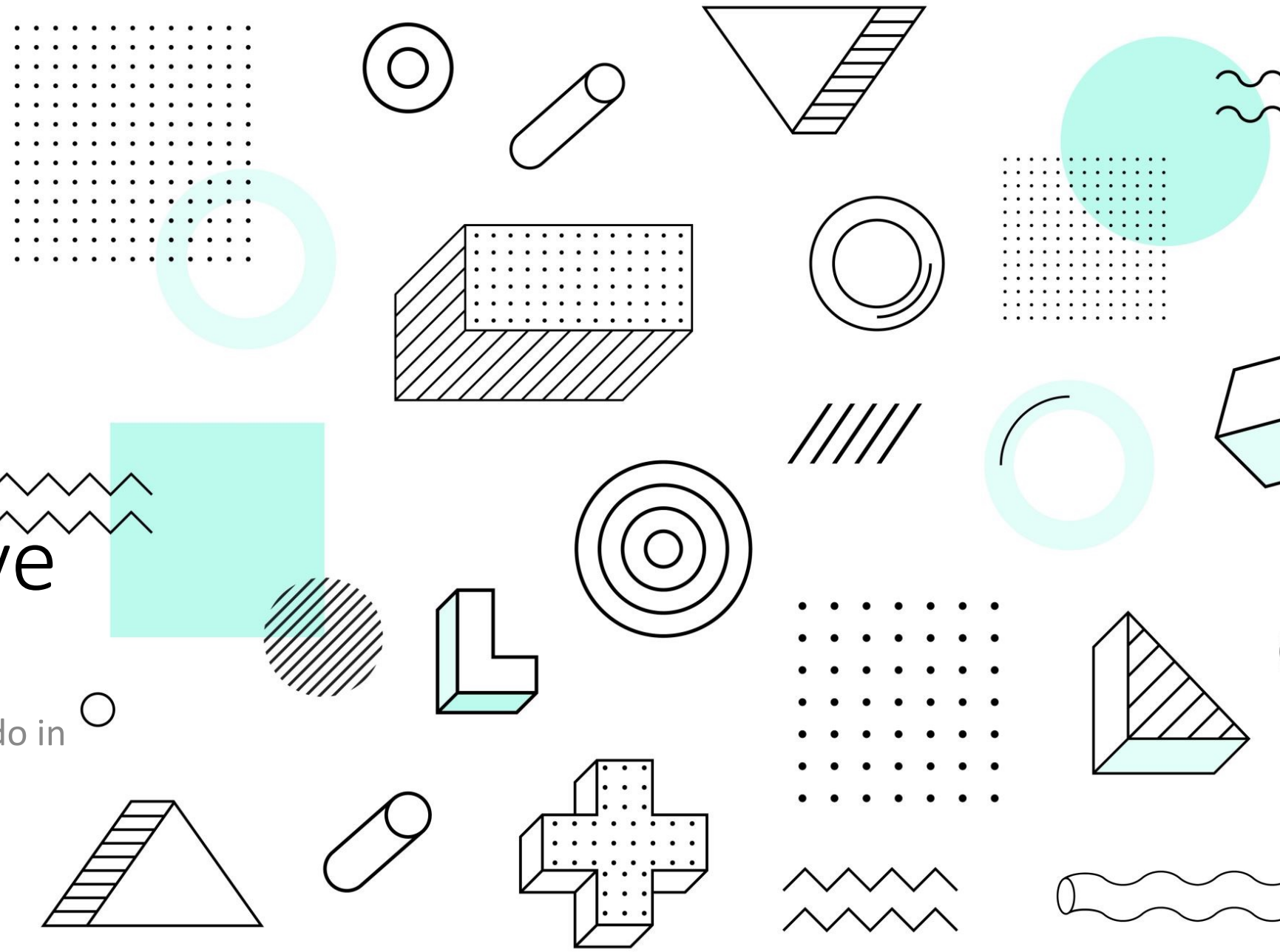
What problems are you solving for your company?

On what basis is your manager evaluating your performance? What is important for them?

Share your thoughts

My perspective

What does a software engineer do in a software product company?



Modern Application Software and its development

A large, distributed, interactive system composed of multiple subsystems (services)

Delivered as a 24/7 available service

Fast release cycles, often weekly or less (in addition to monthly or quarterly ones)

Quick response cycles from customers (often within hours when things go wrong!)

Engineer managing end to end development cycle for their delivery

Infrastructure as code

What is expected of a new engineer?

Comprehend the existing software system and keep the comprehension current

Take end to end responsibility (design, develop, test, deploy, support) for their work

Account for existing system behavior when designing enhancement or defect work.

What makes a fresh engineer valuable in first 12-18 months?

Work well in a team and communicate well.

Solve design problems

Demonstrate quick learnability for existing product

My experience with fresh hires

Good at algorithms and programming, not good at grasping systems

Always willing to create from scratch, not willing to understand existing code to enhance/fix it

Lack design and modeling skills, ability to communicate and discuss their design is lacking too

SaaS startup perspective

What does a software engineer do in a software product company?

Where we are | **Today and Beyond**

zenoti

#1 software for salons, spas, medspas, & fitness centres

12,000 business in over 50 countries

Over 800 people in 9 locations

Zenoti acquires SuperSalon to consolidate leadership in salon and spa software.

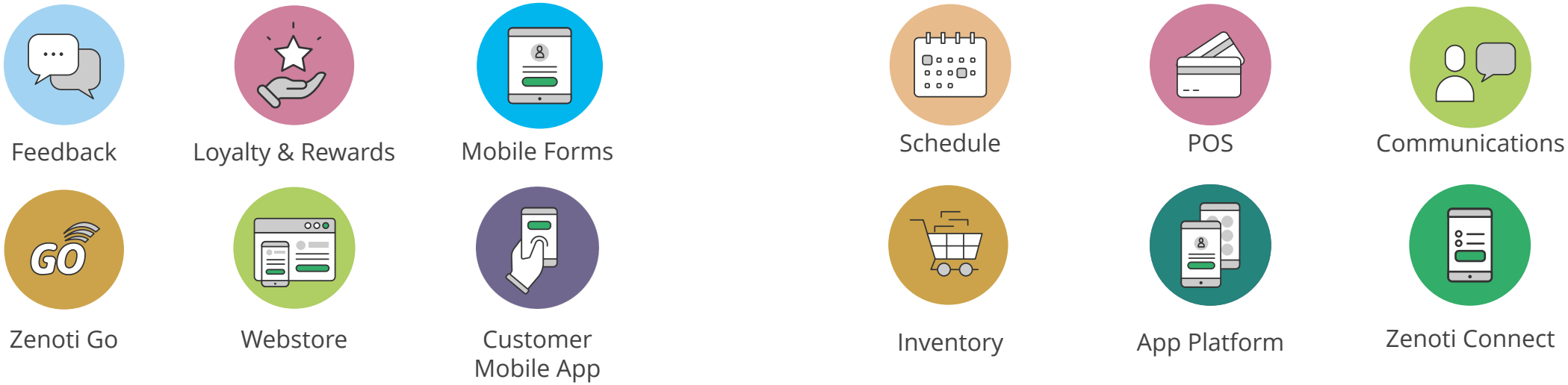
Focused on large enterprises & multi-location SMBs

$290 million in funding – raised $160M in series D funding to surpass $1B unicorn valuation

Our investors include: Accel, Avataar Ventures, Tiger Global, Steadview, Advent International, TPG

Our Presence:

Why Zenoti? | **A Comprehensive Product**



An Example | **Complex Businesses**

MARIO TRICOCI

Leading brand. 30+ years. 14 locations.
30 person call center. 100 receptionists. 1,000+ stylists

RECEPTION

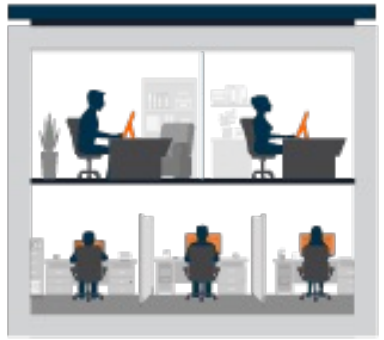
Check-in/check-out = 10-15 mins

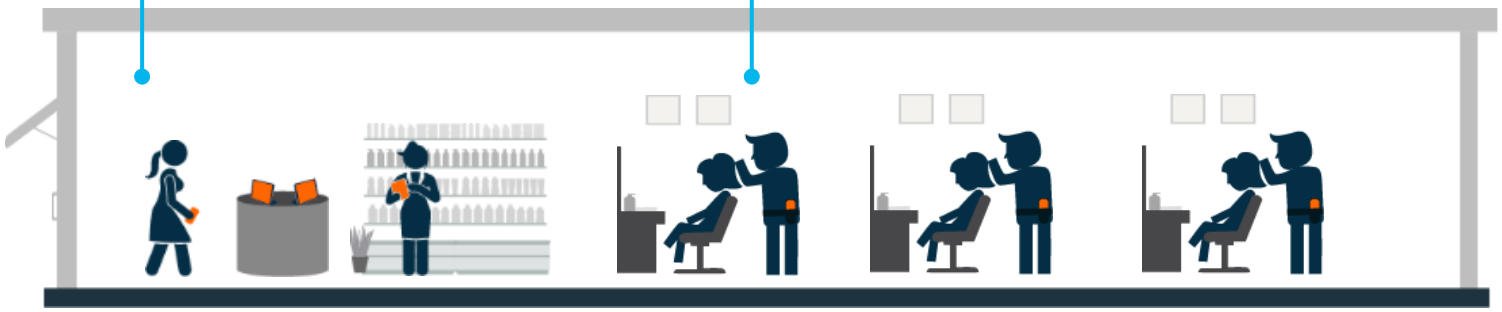
PROVIDERS

Coordinating upsells with front desk

CORPORATE

Lost sales, customer engagement, network management.





CALL CENTER

Coordinating upsells with front desk

Complex operations use up bandwidth of talent & management & stunt growth.

How do you quickly understand a large, complex software?

Is this a skill?

My key insight

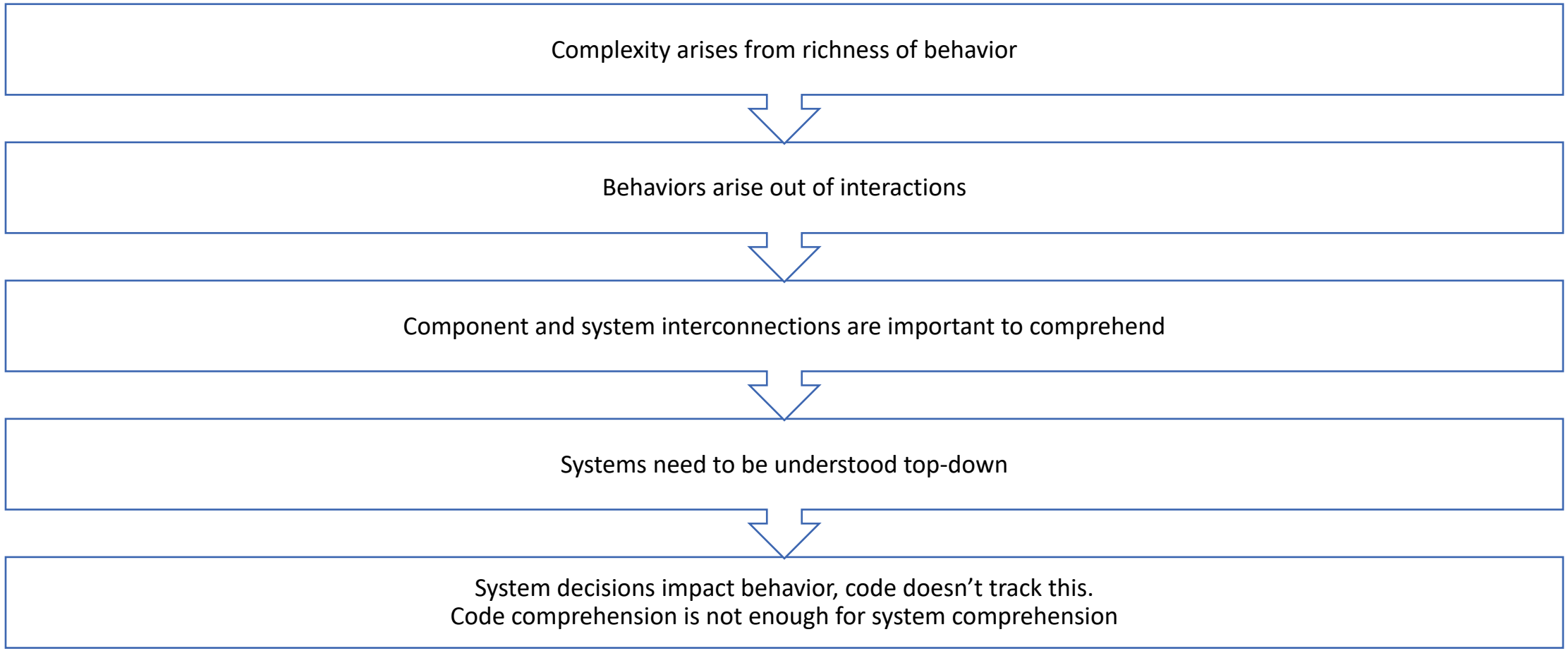
Industry builds systems (without thinking in systems), students learn programs and algorithms

What is a system?

A **system** is a group of interacting or interrelated elements that act according to a set of rules to form a unified whole.

- Wikipedia

Principles we believe in



Let’s try to think of software as systems, and model them as such!

A simulation (product mockup)

https://mrityunjaypalash.github.io/gridwalk/grid.htm

New system (video)

The goal of this feature is to allow users to see product videos and get more interested in buying the product. A new tab called 'Videos' should be available on the product details page. When user navigates to this tab, it should show a set of user videos available for this product. User can select a video to be played in the video playing area at the bottom of this tab. User should be able to stop a playing video and select any other video they like to play

https://www.amazon.in/dp/B0BBN56J5H

Analyze an existing system

https://todolistme.net/

Analyze a large system (focus of the course)

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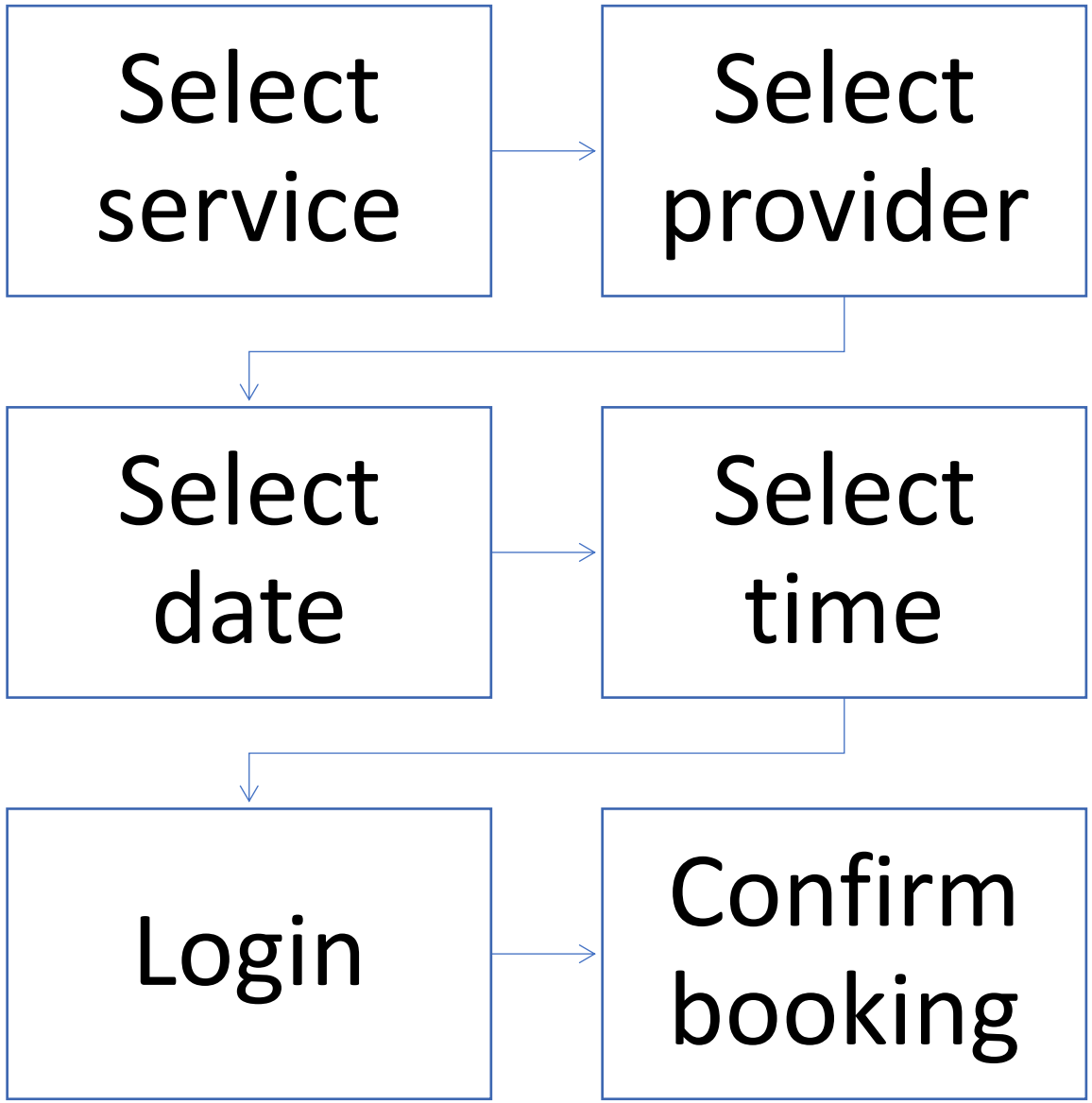
zenotispasalon - Online Booking

Booking Flow



What does an appointment depend on?

- Service
- Provider availability (Barber, Stylist, Masseuse)
- Availability of product required (Hair color, shampoo, for ex.)
- Availability of other resources (Chair, Room, any required equipment)

What kind of system is this?

One-Shot Booking System

(User provide complete information about Service, Provider, and Date/Time in one go)

Vs.

Interactive Booking System

(User provides information in pieces and gets feedback about the choice before proceeding)

Fun homework - Review other software products and try modeling their behavior!

Unit 3 Learning Objectives

- Analyze the behavior of a working software system and model it using Transition Systems
- Understand a large system as a composition of small systems and be able to model the interconnects of systems
- Successively refine the TS model when new inputs are available through hypothesis testing, Q&A, expert opinion, documentation, etc.
- Use transition systems models when designing enhancements in existing (or new) system

What we will cover (8 sessions)

SYSTEM MODELING BASICS

CODE COMPREHENSION BASICS

SYSTEM COMPOSITION

ANALYSIS TECHNIQUE

- We will have workshop style sessions, you work in groups of 2 and present to rest of the class.
- Some lecture sessions to introduce the basics.

Questions?