Software Engineering Notes
Created: 2024-09-15
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REFERENCES

- Introduction to Software Engineering course at the University of Toronto

PRODUCT MANAGEMENT

- About solving customer's problems by deciding on what development team should build.
- A successful software project needs a balance of tech, UX, and business (domain).
- ***Users***: people who use the product you build.
- ***Customers***: people who pay for the product you build.

Determining What Software to Build

1. Define high-level product goals. Answer who, what, why focusing on problem and users not product.
2. Understand what users need using personas, e.g., user stories: As <role>, I want <action/desire>, so that <benefit>.
    a. ***Acceptance Criteria***: conditions a product must satisfy to be accepted by user in story.
3. Product design: build a minimal prototype, UI, how it works, check with stakeholders (users, customers).

Lean Project Management

- Build a prototype that is minimal, MVP (minimum viable product)
- [TODO] Lean startup: https://theleanstartup.com/principles

DATA MODELLING

Data Modelling

- ***Conceptual Data Model*** (CDM): a business-level artifact that defines persistent entities, attributes of entities, relationships between entities.
- ***Logical Data Model*** (LDM): platform independent, normalized (no duplicates) data model made up of tables of 1-1 mappings between CDM entities and LDM tables.
- Database normalization:
    - ***1NF***: each attribute have atomic data and each table has a PK (unique id).
    - ***2NF***: every non-key attribute (column) must depend on all columns of the PK.
    - ***3NF***: attributes determined only by PK.
    - Reference: https://youtu.be/upS2HlUj1gI?t=137
    - TODO: https://learn.microsoft.com/en-us/office/troubleshoot/access/database-normalization-description

Serialization and Persistence

- ***Serialize***: convert in-memory objects into data to be written or streamed as a string or bytes array, (e.g., Python pickle, JSON, XML).
- ***Desterilize***: convert serialize data back into in-memory objects.

Types of NoSQL DBs

- Document, key-value, wide-column, graph.
- TODO:
  https://learn.microsoft.com/en-us/dotnet/architecture/cloud-native/relational-vs-nosql-data
  https://www.mongodb.com/resources/basics/databases/types

Managing Data

- ***Data Access Object*** (DAO): design pattern(??) that abstracts details of underlying data store.
    - TODO: https://www.oracle.com/java/technologies/dataaccessobject.html
    - https://sourcemaking.com/design_patterns/decorator

- ***Object Relational Management*** (ORM): data manipulated in object graph and stored in tables.

SOFTWARE ARCHITECTURE
[TODO]
Getting the Basics - Software Architecture Introduction (part 1) (youtube.com)
Behaviour ○ Structure
The Software Architecture Handbook (freecodecamp.org)
10 Common Software Architectural Patterns in a nutshell | by Vijini Mallawaarachchi | Towards Data Science
○ Model View Controller ○ Client-Server ○ Layered

Design patterns
Catalog of Design Patterns (Specifically look up "Mediator" and "Chain of commands")
10 Design Patterns Explained in 10 Minutes (youtube.com)

Value of architecture increases over time, slow initially
Software Architecture Guide (martinfowler.com)