Byte-Sized

Computer Science for Data People

Part 2: System Design

Topics We'll Cover

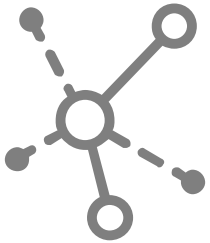
1

Clean Code

Writing performant code that others will be excited to reuse

2

System Design



Building systems and products that scale

3

Collaboration

Working productively with other people

Principles of System Design

User-Centricity  Designing your product around the people who will use it

Modularity Splitting-up your teams and outputs to achieve better outcomes

Scalability  Understanding trade-offs to ‘future-proof’ your architecture

Deep-Dive: User-Centricity

Big Ideas

- **Design your product around user behaviors**
- **Be empathetic; understand through open-ended questions**
- **Don't give users more than they need**

Letting managers dictate the design of a product that they'll never directly use

Designing around specific user experiences, iterating to incorporate their feedback

Benefits

- More time to spend on things that people are actually asking for
- System is easier to adopt and maintain
- Fewer bugs in production caused by loose ends

Related CS Concepts

- Five Why's
- Human-Centric Design
- Encapsulation & Law of Demeter

Deep-Dive: Modularity

Big Ideas

- **Every module / function should do only one thing**
- **Modules should interact using tightly-defined ‘interfaces’**
- **Teams should be similarly organized, collaborating at their intersections**

Trying to find a bug in one long script that does 15+ things

Writing fifteen smaller functions and unit tests so that you don’t have to

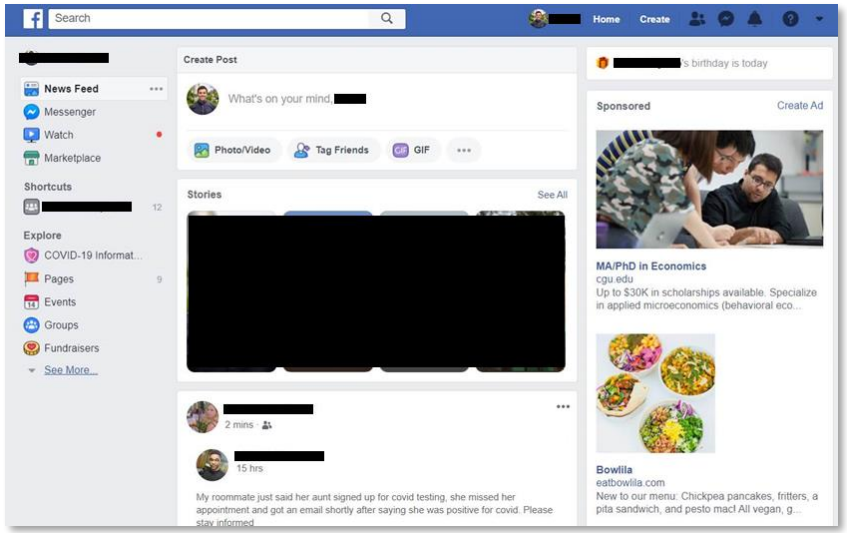
Benefits

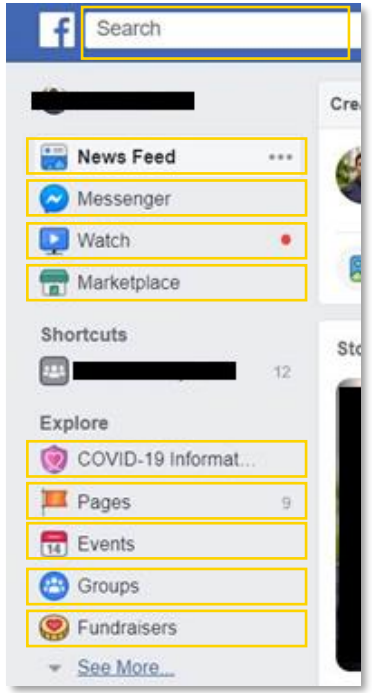
- Easier to build on and reuse existing code
- Easier testing and debugging
- Greater sense of accountability, ownership, and autonomy

Related CS Concepts

- Single-Responsibility Principle
- Design by Contract
- Orthogonality

Real-World Example





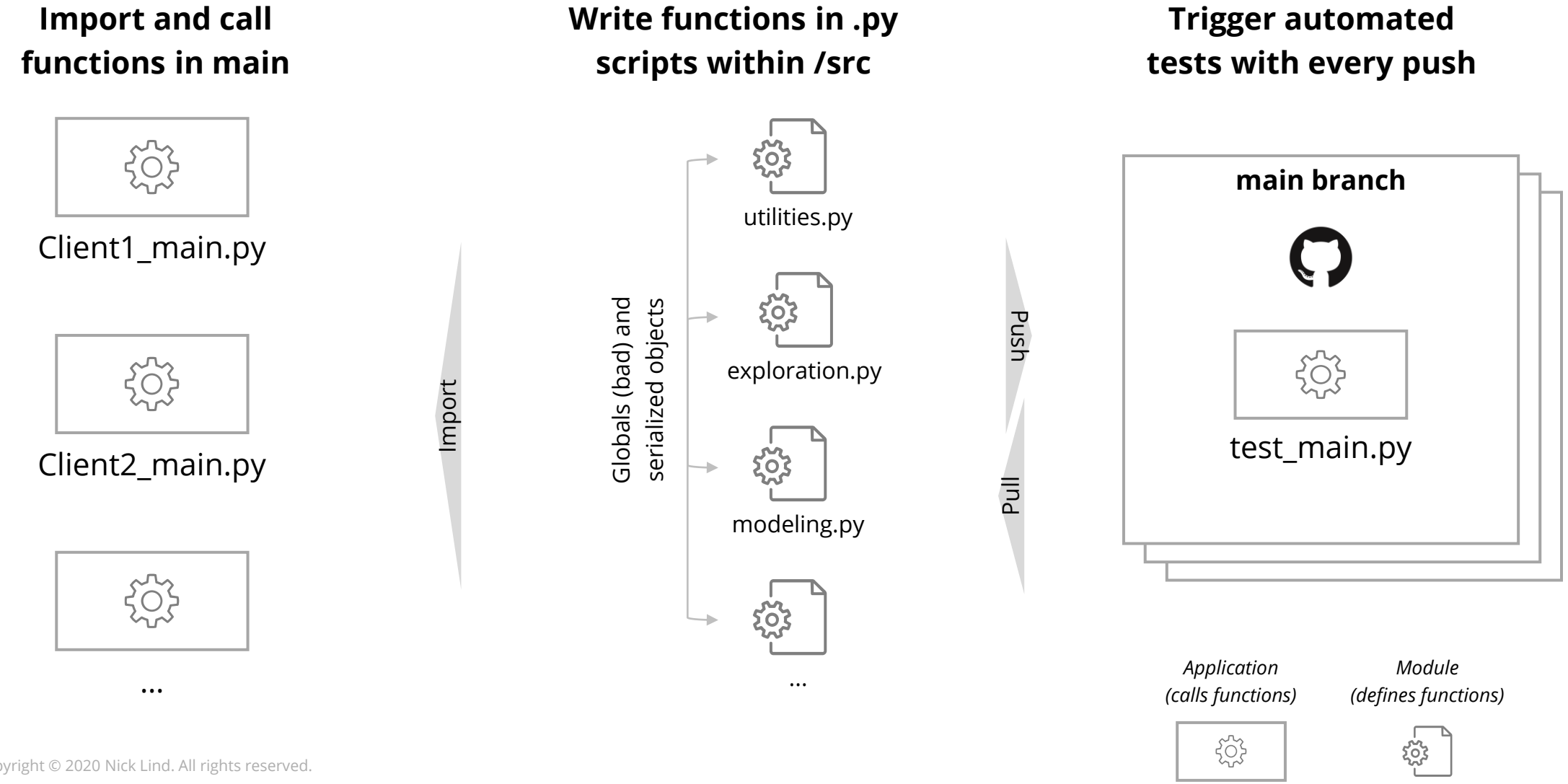
What users see

One cohesive product

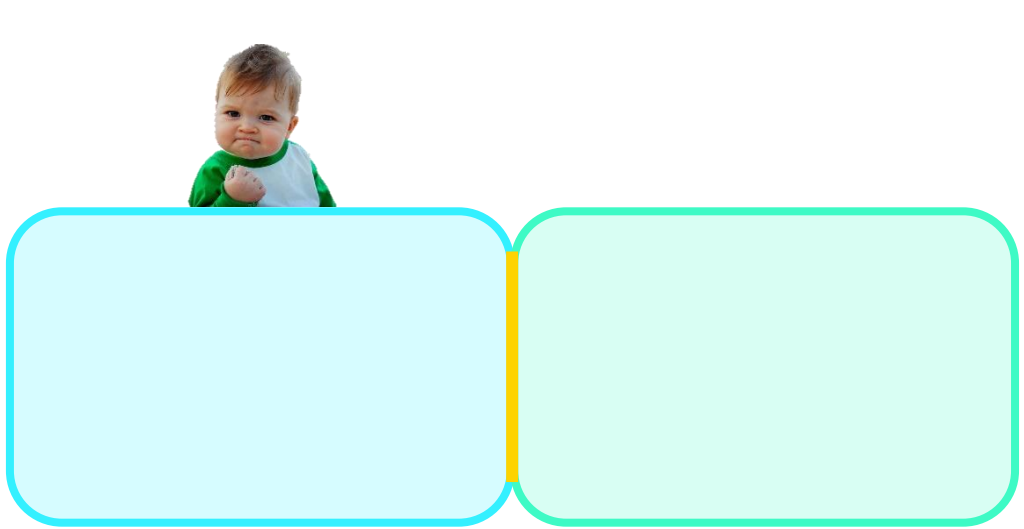
What users don't see

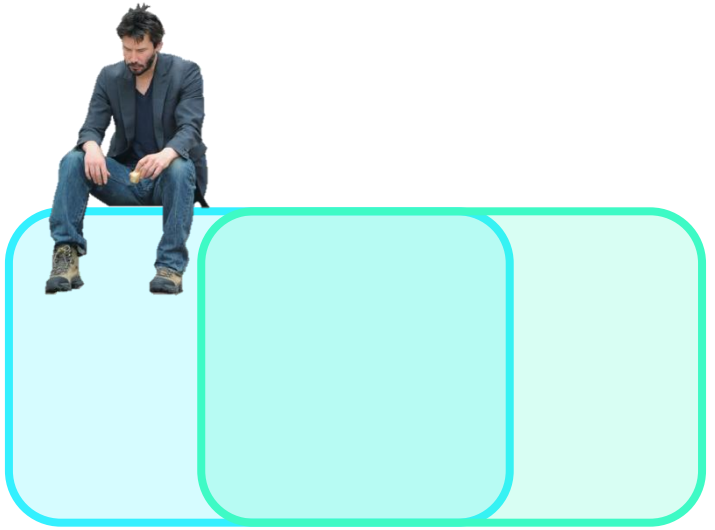
Dozens of loosely-coupled, tightly-aligned teams owning individual features that share data through a shared hidden state

Sample Workflow: Demand Brain



On “Integration”





Do define and test
interfaces between modules

Don’t combine modules that are
designed around different behaviors

Deep-Dive: Scalability

Big Ideas

- **Ship product; don't overoptimize or sweat reversible design decisions**
- **Swap-out modules as your requirements change**
- **Profile cost, complexity, and space-time implications for big decisions**

Being tempted by fashionable technology (looking at you, k8s!)

Keeping it simple until your user requirements demand an upgrade

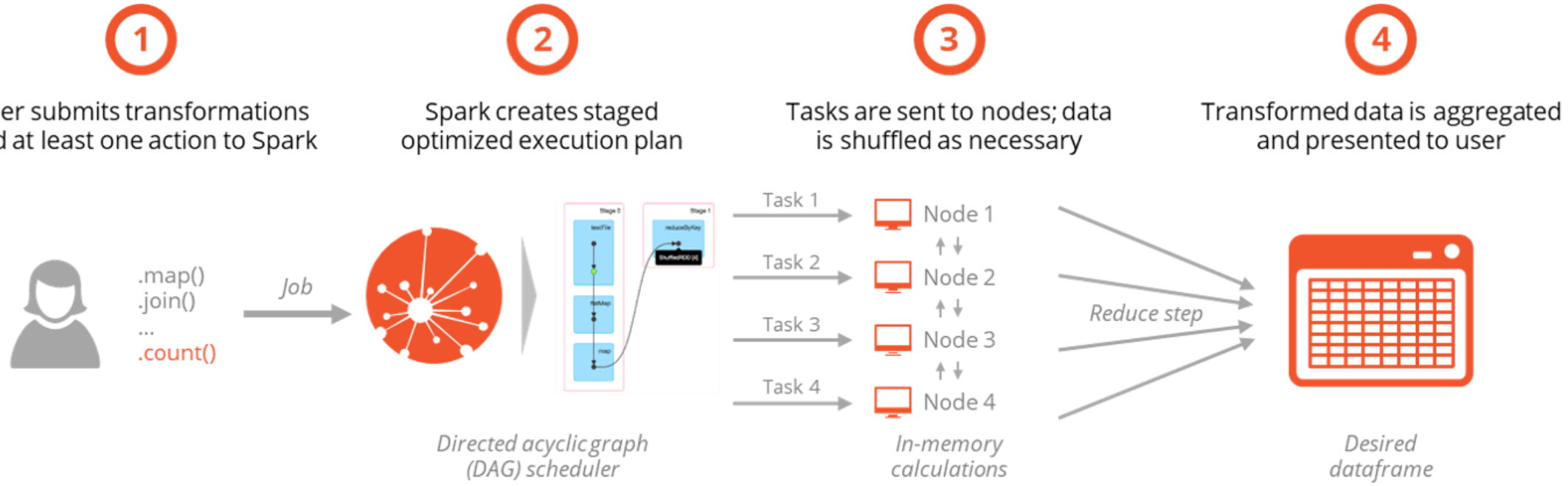
Benefits

- Spend more time with users, less on technology
- Scale your product without rewriting code
- Make data-driven decisions regarding your architecture

Related CS Concepts

- Shiny Object Syndrome
- Horizontal Scaling
- Bottlenecks (e.g., compute time, bandwidth, serialization, schedulers)

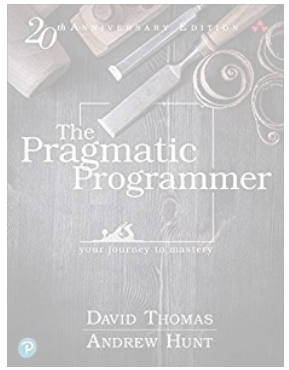
Horizontal Scaling Example: Spark

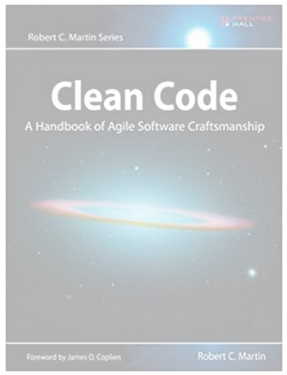


Book Recommendations

1

Clean Code





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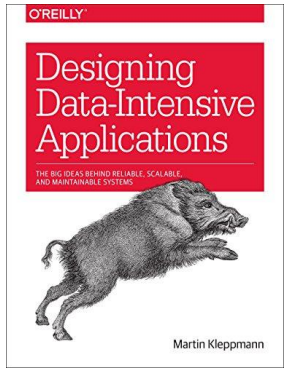
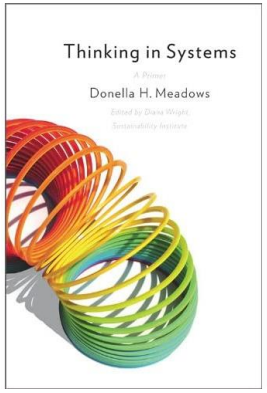
System Design





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Collaboration