

# LEARNING FROM THE PROS

## MODERN DATA SYSTEMS FOR CLINICIANS AND SCIENTISTS

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Grand Rounds

Department of Urology

University of California, Irvine

March 6, 2017

# DAMNIT EXCEL!

## THERE MUST BE A BETTER WAY?

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**WHO AM I?**

**NOT A PHYSICIAN**

**NOT A SCIENTIST  
(ANYMORE)**

**I BUILD SOFTWARE**

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VANDERBILT KENNEDY CENTER

*Disabilities—Hope through Discovery*



 **Stratassan**

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## A BRIEF OUTLINE

- ▶ How Internet Applications Work
- ▶ Desirable Traits of any Data Management System
- ▶ Excel is not your friend
- ▶ A happy middle ground?

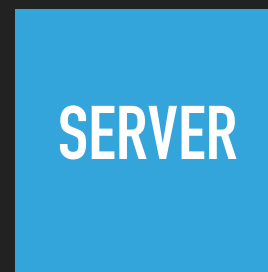


Google



NETFLIX

The  
New York  
Times



# DESIRABLE TRAITS IN DATA MANAGEMENT SYSTEMS

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## BRIEFLY...

- ▶ High Availability
- ▶ Auditability
- ▶ Strong Role-Based Access Controls
- ▶ Data Validation
- ▶ Programmatic Access

### HIGH AVAILABILITY

- ▶ Accessible from multiple locations
- ▶ Simultaneously accessible
- ▶ Capacity & Stability to tolerate high loads
- ▶ Data Retention
- ▶ Data Back Ups
- ▶ Failure Contingencies

### AUDITABILITY

- ▶ Automatically generated trail of operations that create, update or delete data.
- ▶ Handled as part of the application, not the user.
- ▶ Always know who altered and when it was changed
  - ▶ Really good systems may require comments

### STRONG ROLE-BASED ACCESS CONTROLS

- ▶ Not every user should have the same capabilities!
  - ▶ Read-Only
  - ▶ Write-Only
  - ▶ Admin
- ▶ Only superusers can alter schema (design of data)

### DATA VALIDATION

- ▶ Before accepting or delivering data, apply validation
- ▶ Reject for:
  - ▶ Invalid types
  - ▶ Improper Formatting
  - ▶ Cross-field inconsistencies
- ▶ Prevents entire classes of downstream problems

### PROGRAMMATIC ACCESS

- ▶ Render & accept data in formats accessible to machines
- ▶ Create, Read, Update, Destroy operations
- ▶ Enables workflows that:
  - ▶ can “infinitely” scale
  - ▶ are not susceptible to random errors
  - ▶ can be tested to prevent systematic errors
  - ▶ are extremely cost-effective



**EXCEL IS NOT  
YOUR FRIEND**

# EXCEL IS YOUR ENEMY BECAUSE IT

- ▶ does not automatically generate strong audit trails.
- ▶ allows any and all schema changes.
- ▶ Does not provide strong access controls.
- ▶ Is not available anywhere except your local machine.
- ▶ Is file-based and does not provide methods to merge disparate changes.
- ▶ enables analyses that are not reproducible or testable.
- ▶ doesn't care about data validation and will often coerce values behind the scenes.

So...?

**REDCAP!**

### REDCAP IS...

- ▶ a web-based application for creating & managing online surveys and databases.
- ▶ Features:
  - ▶ Strong Role-Based Access & Permissions
  - ▶ Data Validation and rich field support
  - ▶ Automatic audit logs of data creation & updates
  - ▶ HTTP-based API for automated export & import

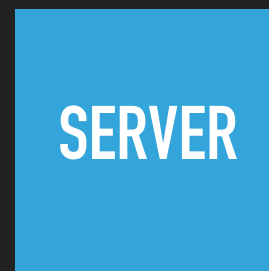
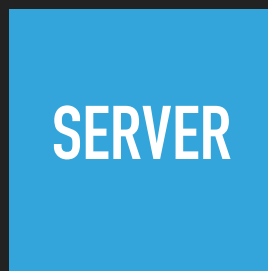
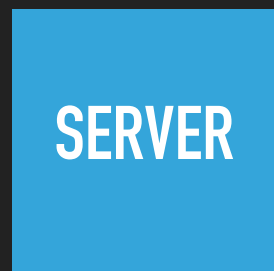
**YOU**



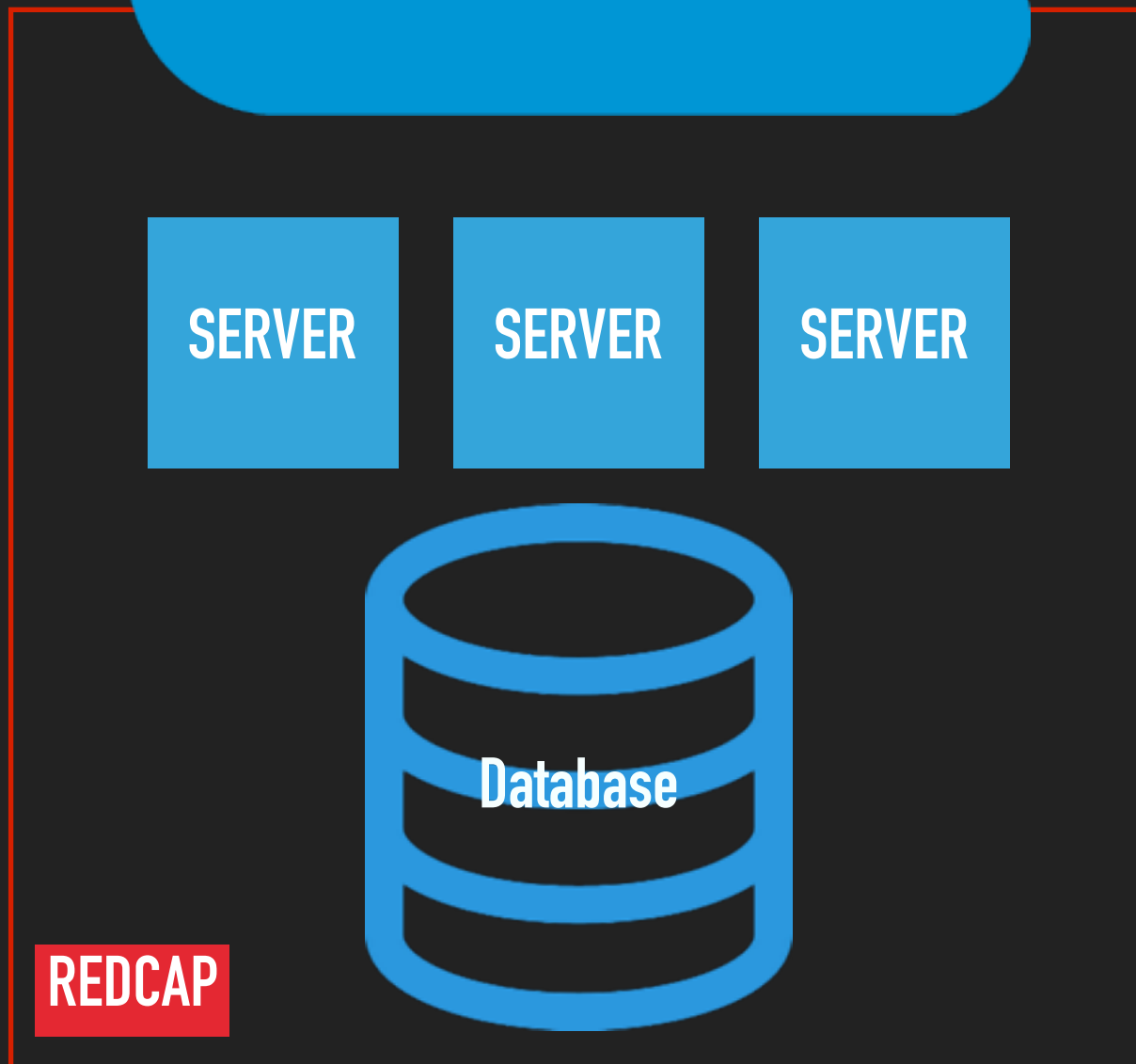
**REDCAP**

**BROWSER**

**YOU**



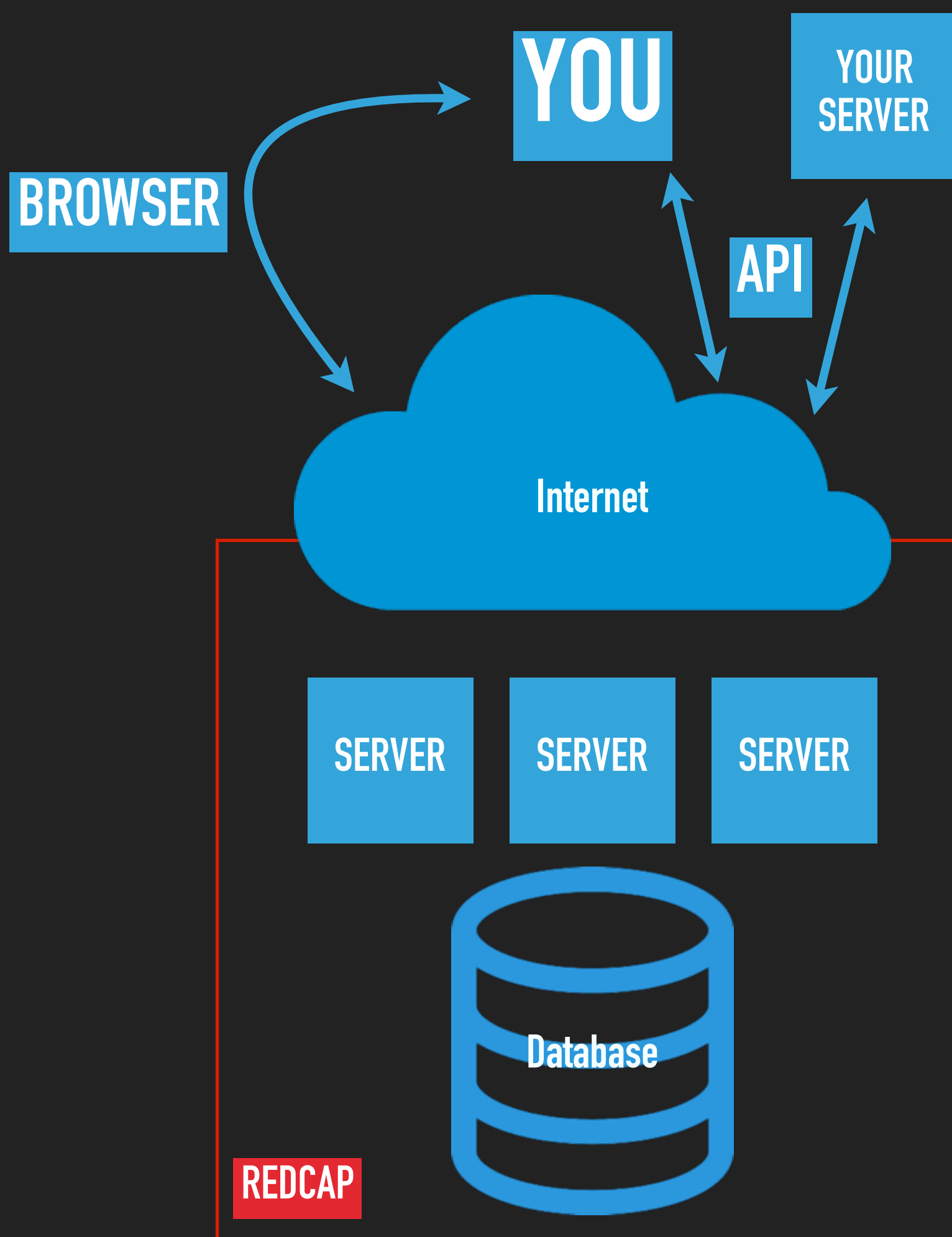
**REDCAP**



### REDCAP PROVIDES

- ▶ High availability. IT professionals manage the service.
- ▶ Scalability. Multiple people importing/exporting data at the same time.
- ▶ Role-based access to updating records, project-level fields.
- ▶ Audit trails. Know exactly who changed data when.
- ▶ Programmatic access. Your data is free from the confines of a file.



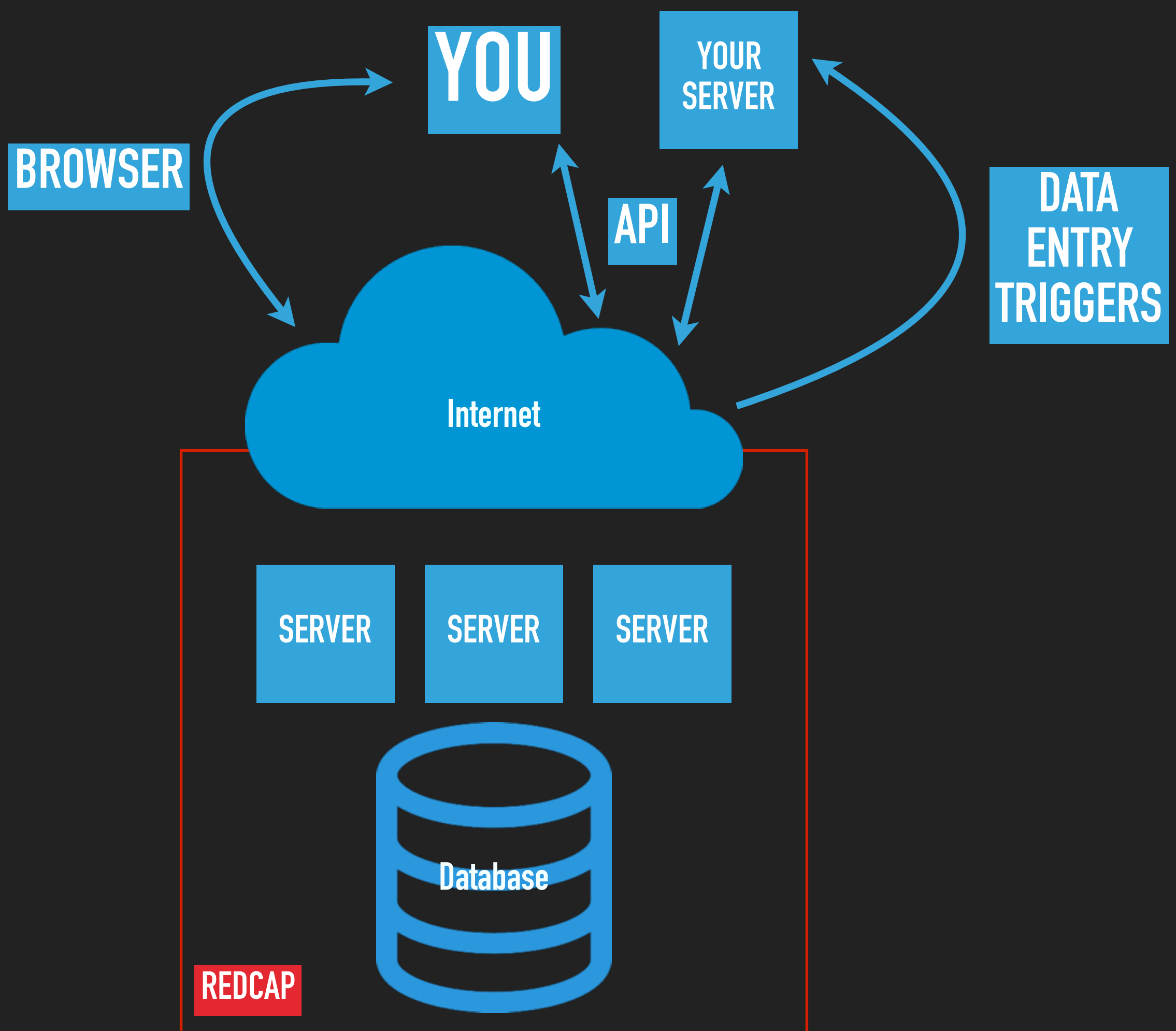


### WITH THE REDCAP API, YOU CAN...

- ▶ Export and Import data to create, read and update data on a per-record basis.
- ▶ Upload, download and delete files.
- ▶ Apply complex transformations to your data in a repeatable and verifiable fashion.
- ▶ Stop relying on humans to perform very specific, mission-critical data workflows.
- ▶ Focus on doing what you do best and let machines do the rest.

### DATA ENTRY TRIGGERS

- ▶ Requests to the API occur only when you make them (scheduled or on-demand).
- ▶ Data Entry Triggers are a way for REDCap to tell your system when data has been entered or updated.
- ▶ Based on this notification, you could make API requests and run a workflow **exactly when data needs to be processed.**



**LET'S TALK ABOUT  
ROBOTS**

# REPORTING

# ANALYSIS

**EXTERNAL  
SYSTEMS**



**QUESTIONS?**

**THANK YOU!**