Sterling Survey System

Designing the Server, Database, and Administrative Tools in Support of a Multi-Mode, Multi-Platform Survey Authoring Framework

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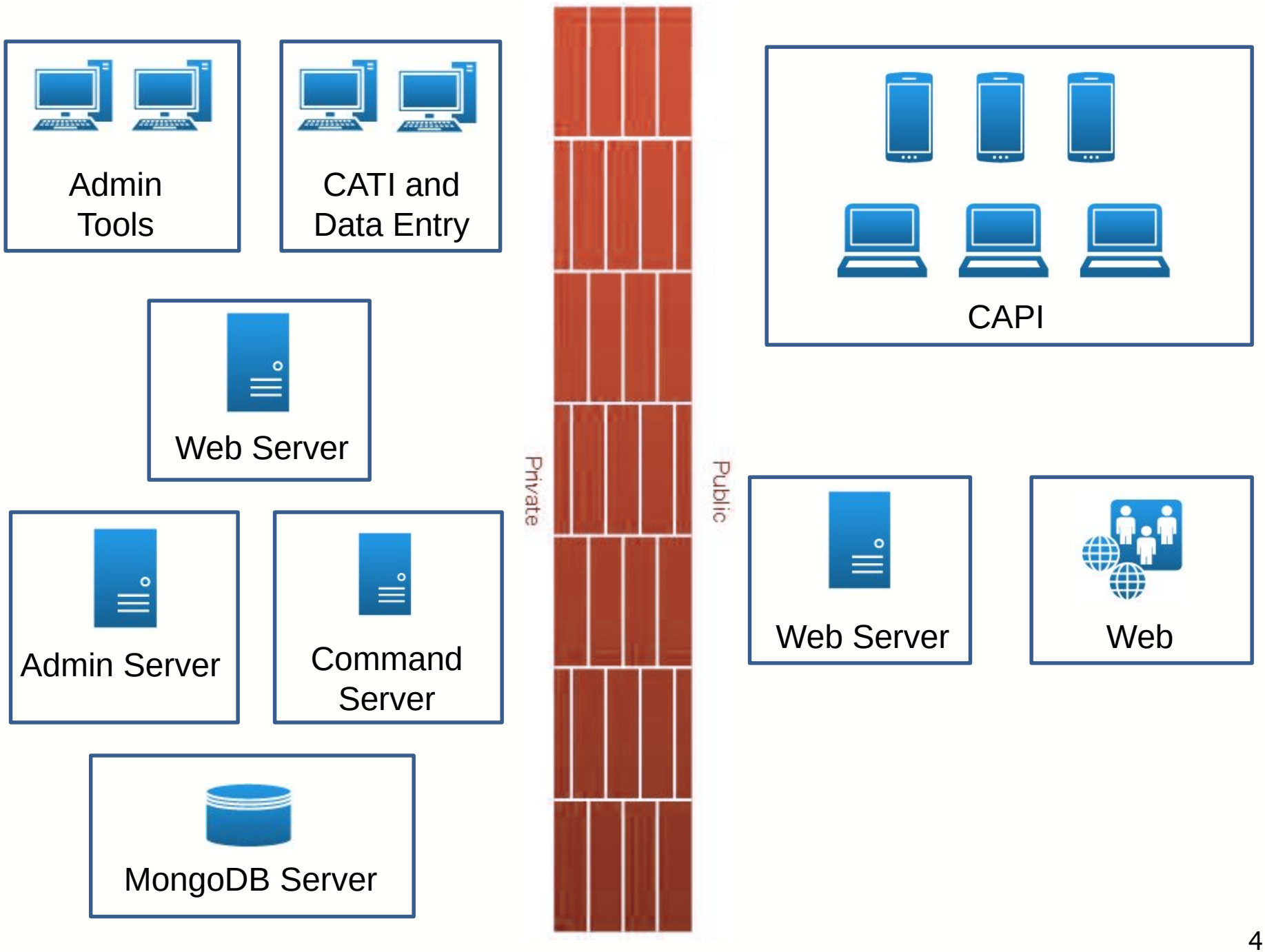
Sterling Survey System

- Survey Authoring Framework
  - All survey modes
  - Multi-Mode
  - Multiple Platforms and devices

Server-Side Implementation

- Server configuration
- Server Framework
- Database
- Survey administrative tools


Admin Tools
CATI and Data Entry
CAPI
Web Server
Private
Public
Admin Server
Command Server
Web Server
Web
MongoDB Server

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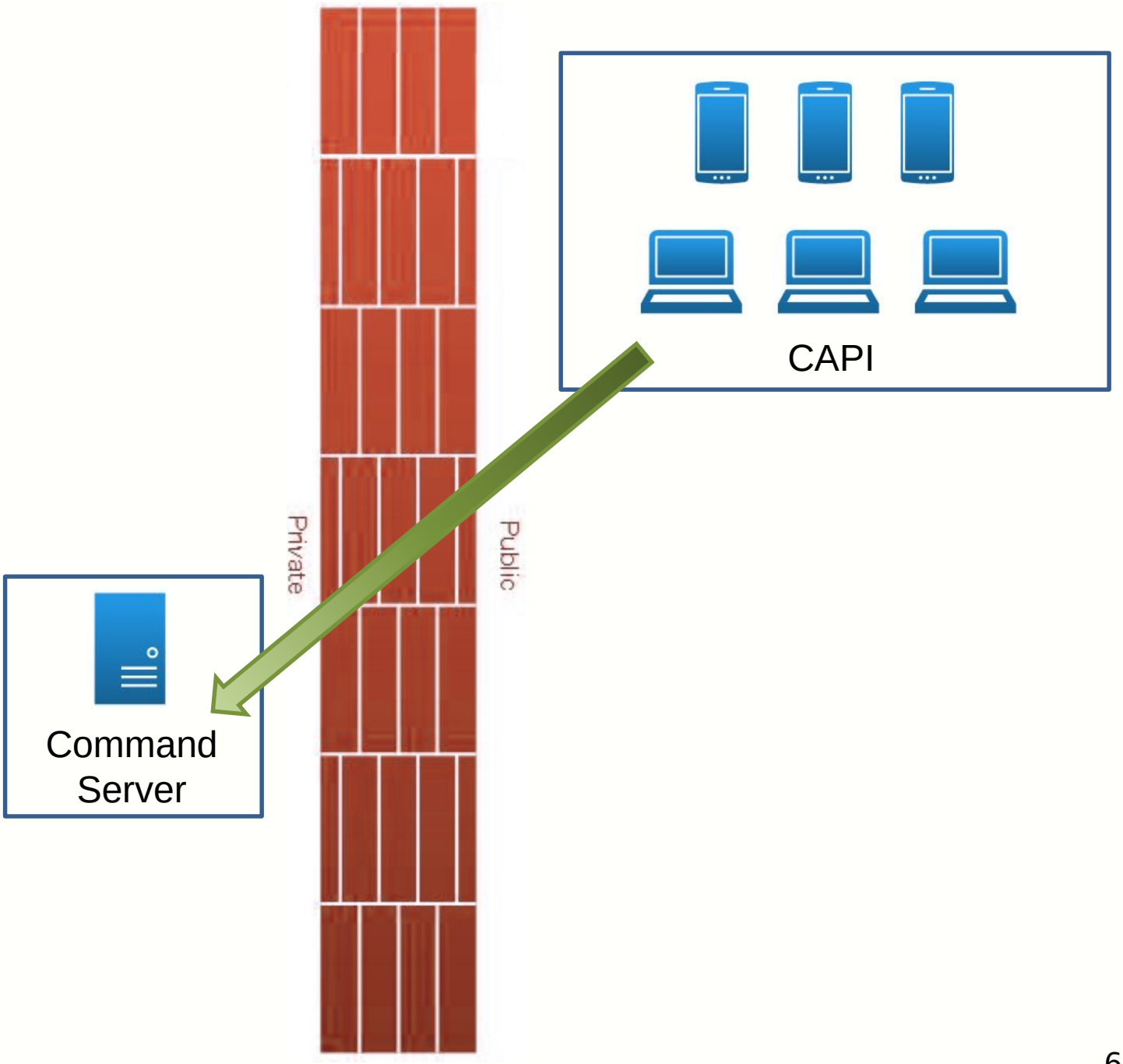
CAPI
Private
Public
Command
Server

Server Framework Technology – Node.js

- Open-Source JavaScript runtime environment
  - Execute JavaScript code outside of a browser
- Open-Source libraries
    - Extend capabilities of standard JavaScript
    - Examples
      - https
      - Jquery
      - Bluebird
      - JsonToCsv

Why Node.js?

- JavaScript, same software language used for instrument authoring
- Large open-source libraries
- Ability to build a targeted web communication protocol
  - Full web-server functionality not desired
  - Only small set of valid commands needed

Command Server Functions

- Programmed using Node.js
- Validates client-issued commands
  - JSON data structure containing parameters
  - Invalid commands or parameters are not processed
- Executes allowed commands
- Communicates with database
  - User account with limited access
  - Updates
  - Queries data to return to client device

Command Server – Three Commands

- Save cases to database
  - Collected by the instrument
  - All data not previously saved

- Synchronize
  - Adds or removes assigned cases on client device
  - Updates case ownership in database

- Save LocalStorage
  - Copies client device's LocalStorage to database
  - Backup and debugging resource

Server-Side Implementation

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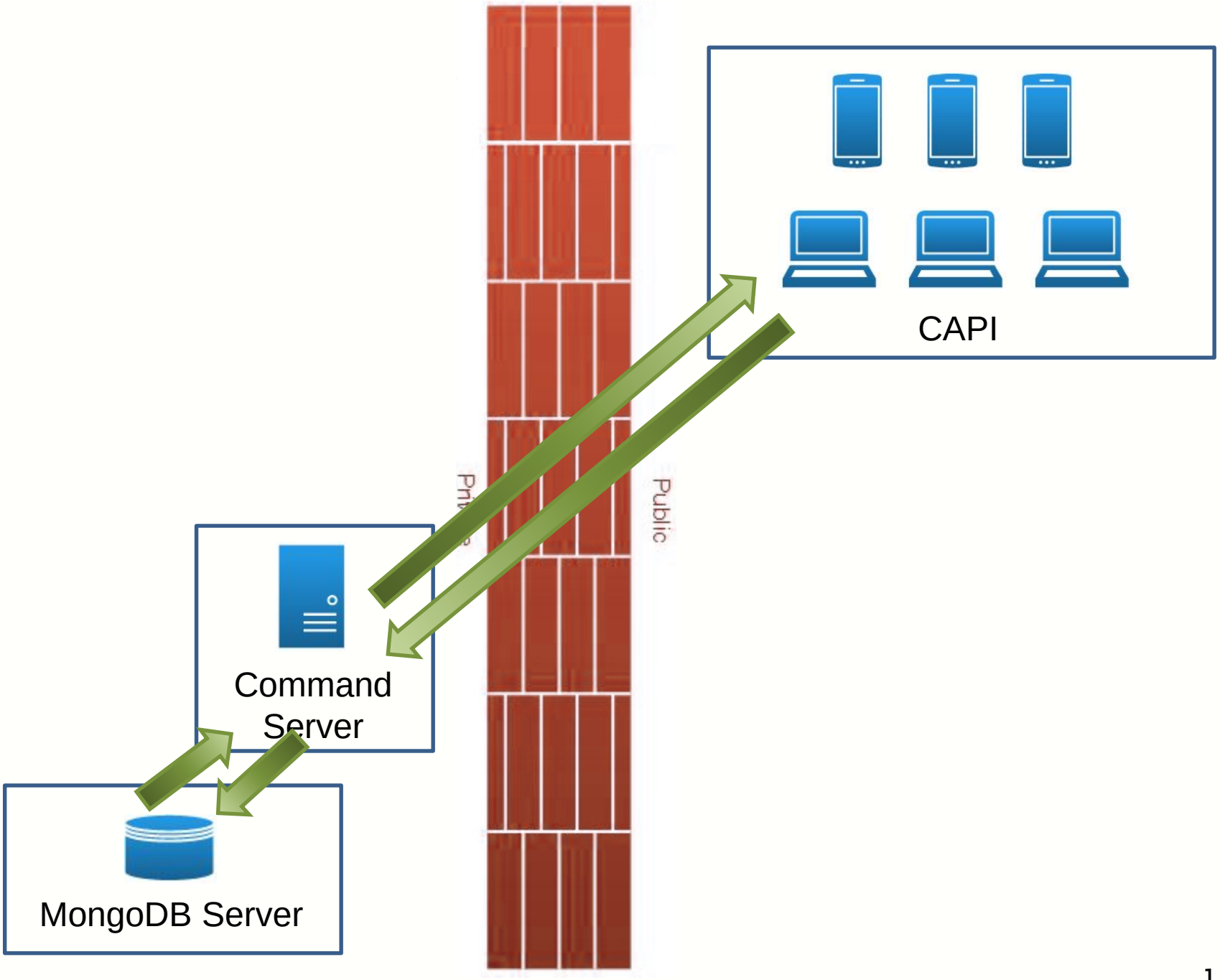
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Server Database Technology – NoSQL Database

- MongoDB
  - Stores documents, not records
  - Associates data in complex ways
  - JSON data structure
    - Key/Value pairs
    - Nested sub-documents
      - As many nested sublevels as you need
      - Rosters
  - Flexibility in database design
  - Data mining

Why Not SQL Database?

- Relational model
  - MySQL
    - Familiarity
    - Wide-adoption
  - Strict schema definitions
    - Changes during field period
    - Schema changes over time
      - Querying across multiple projects may fail

Why Not SQL Database?

- Entity-Attribute-Value (EAV) model

csid	q1	q2	q3	q4	q5	q6
113489	Y	15	10/31/2016	N	DK	14

entity	attribute	value
113489	q1	Y
113489	q2	15
113489	q3	10/31/2016
113489	q4	N
113489	q5	DK
113489	q6	14

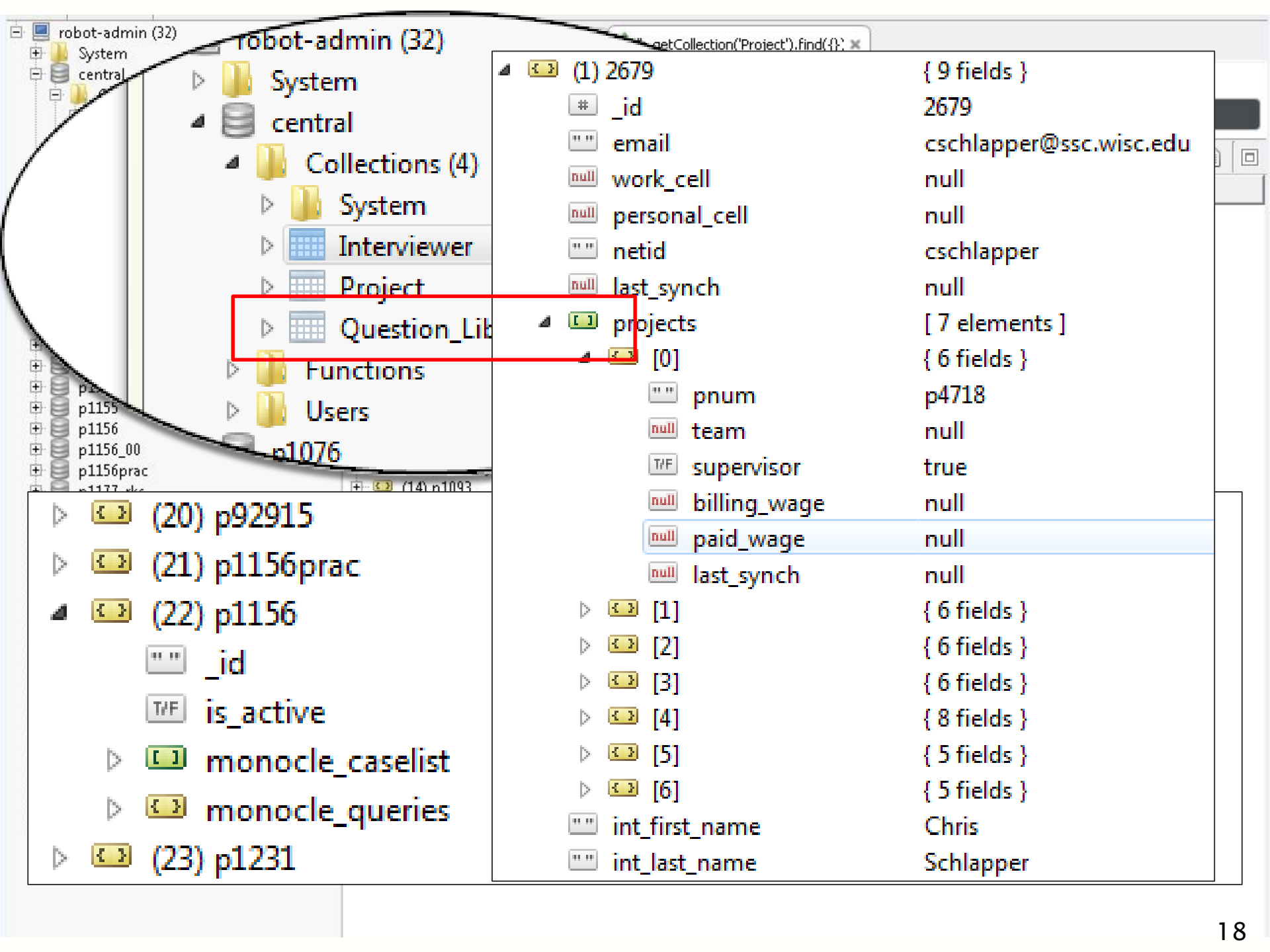
- Provides flexibility
- Writing queries more challenging
  - Search the attributes to understand the data structure
- Slow query response time
  - Pivot tables, GROUP_CONCAT

Why MongoDB?

- Non-Relational database
  - No mandatory schema definitions
    - Allow for changes during field period
  - Implement standard variables
    - Allow for querying across multiple projects without breaking for older projects
  - Nested sub-documents

Why MongoDB?

- Big Data
  - Indices
  - Fast query-response time
  - Scale horizontally
    - Distribute data across multiple machines
- JSON data structure
    - Native to JavaScript/node.js
    - Client-side and server-side


robot-admin (32)
System
central
Collections (4)
System
Interviewer
Project
Question_Lib
Functions
Users
p1076
(1) 2679
{ 9 fields }
_id
2679
email
cschlapper@ssc.wisc.edu
work_cell
null
personal_cell
null
netid
cschlapper
last_synch
null
projects
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[0]
{ 6 fields }
pnum
p4718
team
null
supervisor
true
billing_wage
null
paid_wage
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last_synch
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[1]
{ 6 fields }
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[3]
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[4]
{ 8 fields }
[5]
{ 5 fields }
[6]
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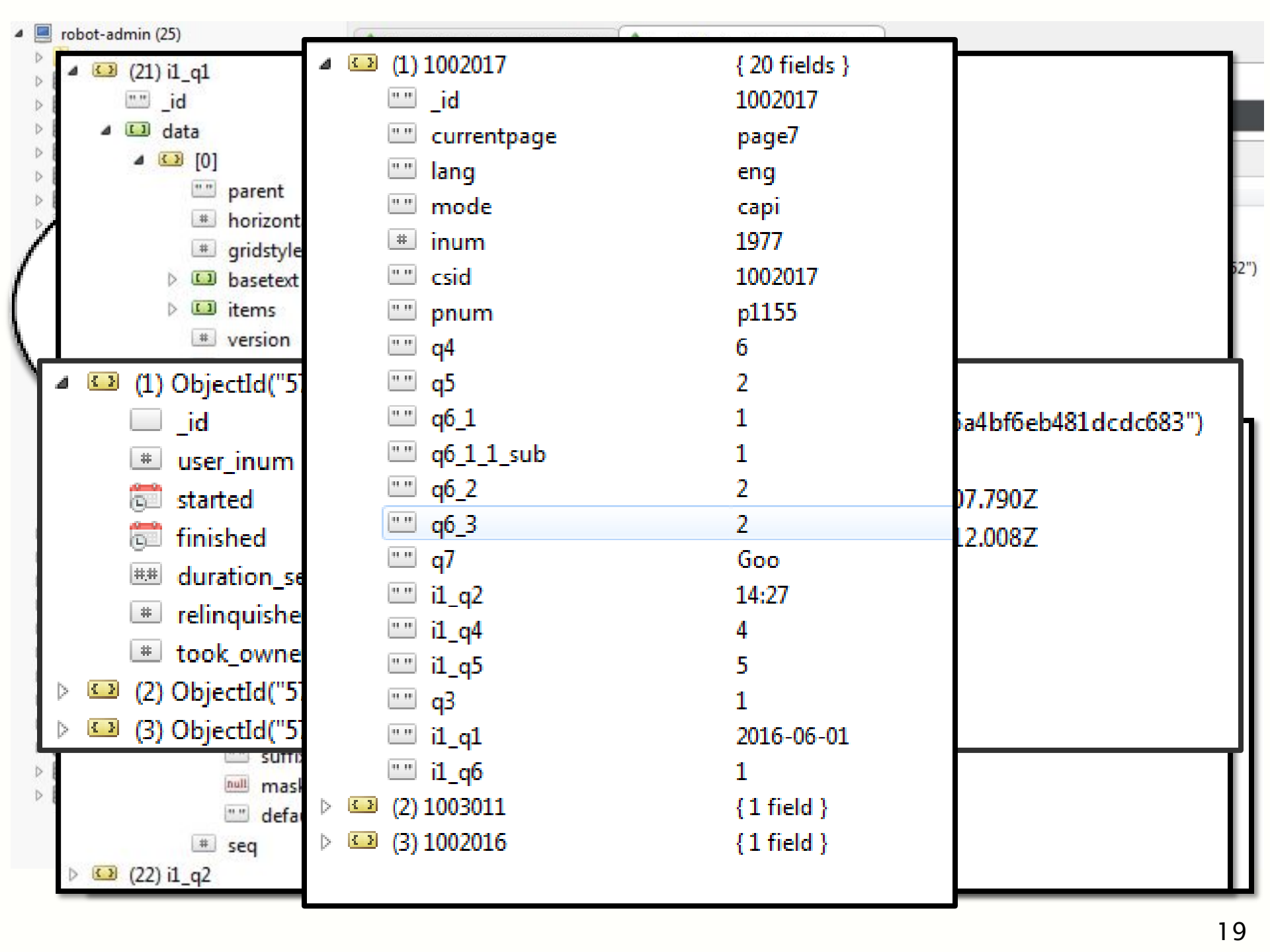
int_first_name
Chris
int_last_name
Schlapper
(20) p92915
(21) p1156prac
(22) p1156
_id
is_active
monocle_caselist
monocle_queries
(23) p1231


robot-admin (25)
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[0]
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(1) ObjectId("5
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q5
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q6_1
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q6_2
2
q6_3
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q7
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i1_q2
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i1_q5
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q3
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(3) 1002016
{ 1 field }
a4bf6eb481dcdc683")
07.790Z
12.008Z

Node.js Implementation Notes

- Node Package Manager (npm)
  - Install libraries
    - Some libraries depend on other libraries
    - Global or local installation
- Asynchronous code execution
  - Ideal for client-side website
  - Challenges on server-side
  - Promises
    - Bluebird module

MongoDB Notes

- No security “out-of-the-box”
- NoSQL query language
  - Different from SQL
  - Retrieving data from sub-documents
- RoboMongo
  - Administrative console program

MongoDB Notes – Database Design

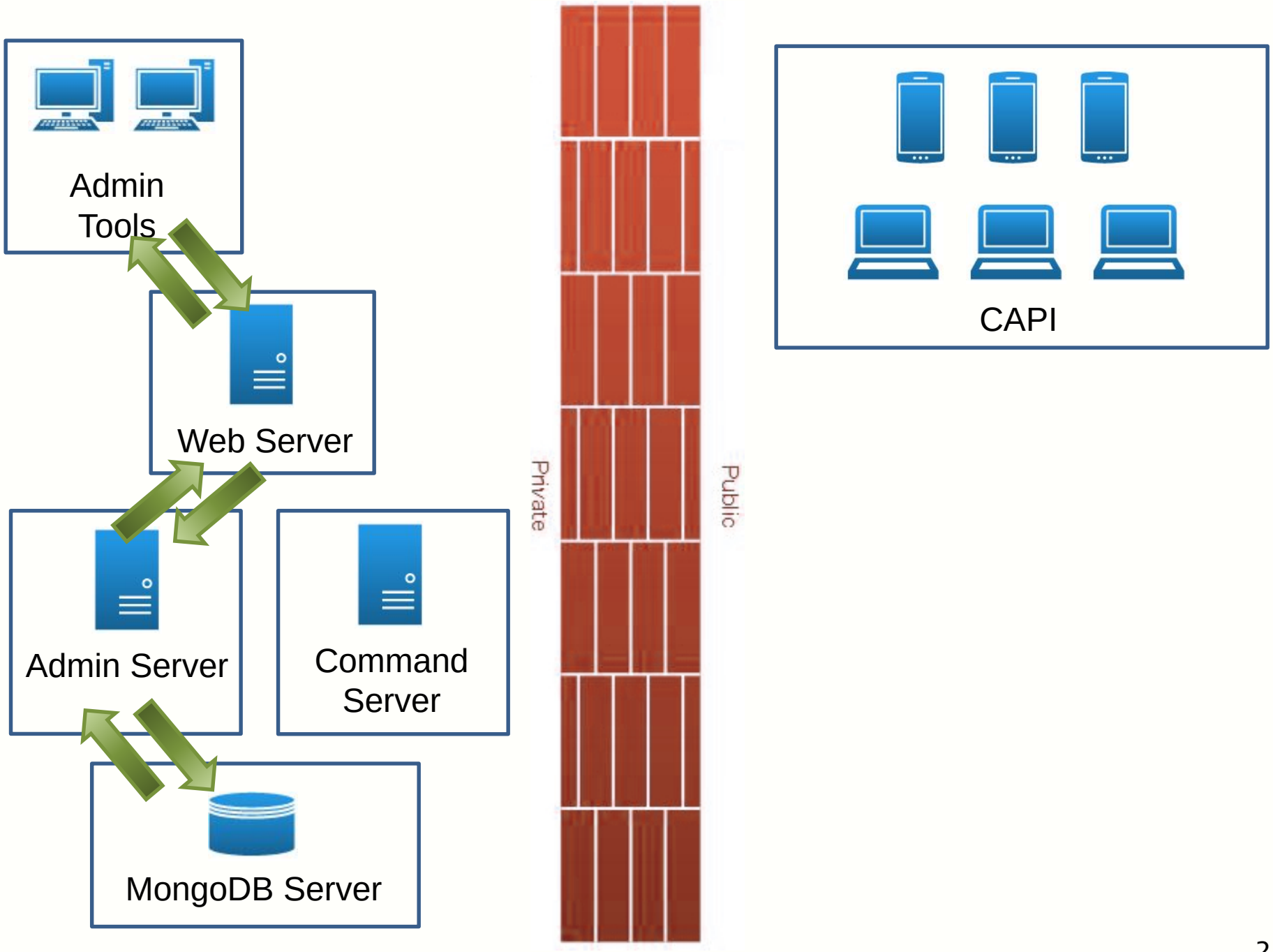
- Optimize for NoSQL
- No table joins
  - Run multiple queries and programmatically join the data
  - Data-duplication recommended
    - Store “join” data as sub-document
- JSON structure
  - Associative arrays
  - Avoid using a value for the key
    - Optimized for client-side
    - Difficult to query on database
      - Key analogous to a database column name

Server-Side Implementation

- Server configuration
- Framework
- Database
- Survey administrative tools

Administrative Requirements

- Used by Project Directors, Programmers, and Field Supervisors
- Save Question data
  - During survey authoring process
- Instrument debugging
- Load sample
- Manage project during field period
  - Data dashboard and reports
  - Case assignment
  - Roll-back case to a prior version
- Data delivery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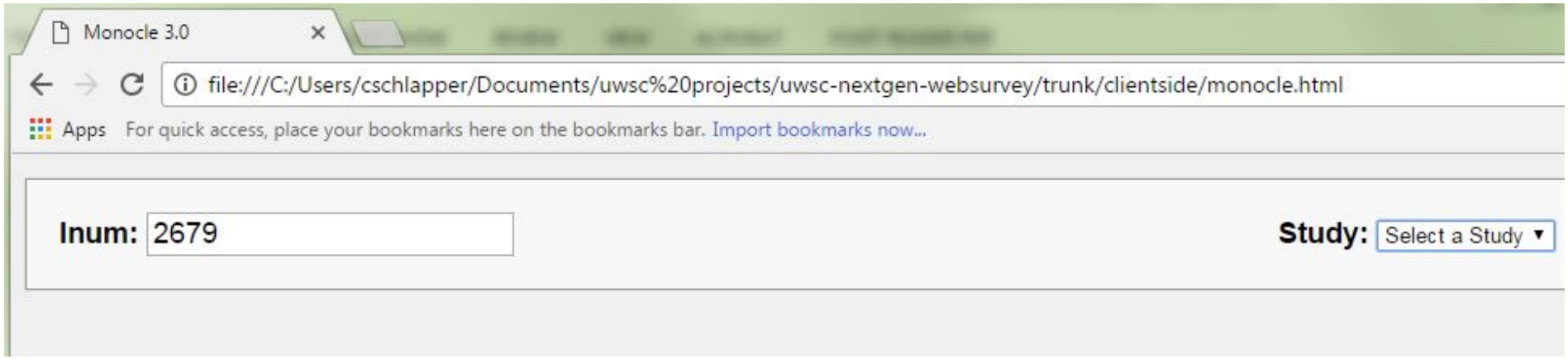
Admin Server Functions

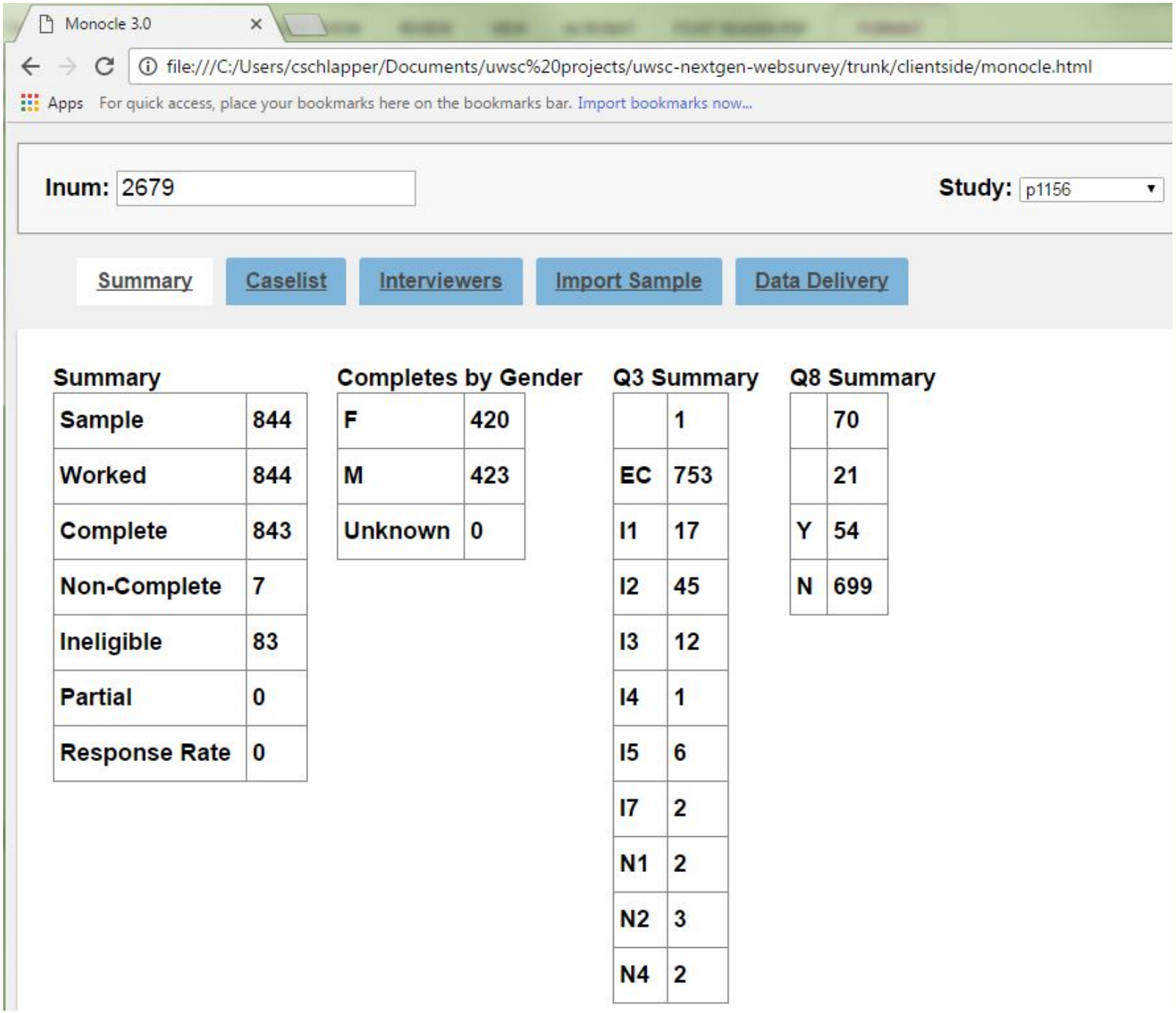
- Programmed using Node.js
- Separate path from client-issued commands
  - Behind firewall
  - More functionality
  - JSON data structure containing parameters
  - Invalid commands or parameters are not processed
  - Requires greater security permissions
- Executes allowed commands
- Communicates with database
  - User account with elevated access
    - Create new schema
    - Access to administrative data collections

Admin Server – Commands

- Save Question data during authoring process
- Load sample data
- Create data delivery files
- Fulfill queries for Project Management software

Monocle 3.0


Monocle 3.0
file:///C:/Users/cschlapper/Documents/uwsc%20projects/uwsc-nextgen-websurvey/trunk/clientside/monocle.html
Apps
For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now...
Inum: 2679
Study: Select a Study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Apps For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now...
Inum: 2679
Study: p1156
Summary
Caselist
Interviewers
Import Sample
Data Delivery
Summary
Sample 844
Worked 844
Complete 843
Non-Complete 7
Ineligible 83
Partial 0
Response Rate 0
Completes by Gender
F 420
M 423
Unknown 0
Q3 Summary
1
EC 753
I1 17
I2 45
I3 12
I4 1
I5 6
I7 2
N1 2
N2 3
N4 2
Q8 Summary
70
21
Y 54
N 699

Inum: 2679 Study: p1156

Summary | Caselist | Interviewers | Import Sample | Data Delivery

Assign Selected Cases to: Schlapper, Chris (2679) Assign Cases

Show 10 entries

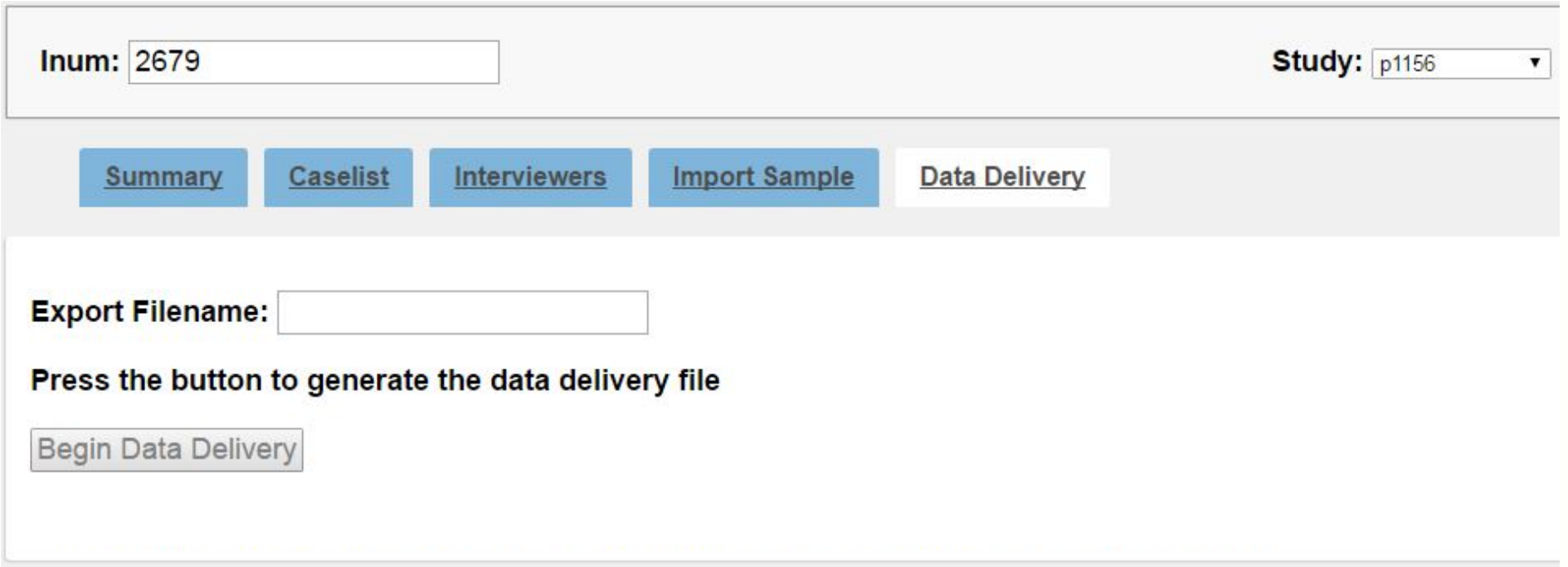
Case ID	Last ID	Accessed	Version	Code	Attempt Success	Type	Stratum	Date/Time
1002011	16	5	1	1100	12	Cig	3	2016-07-03T15:13:03.068Z
1002016	16	6	1	1100	1	Cig	3	2016-06-23T16:02:00.794Z
1002027	16	1	1	1100	1	E-Cig	3	2016-06-23T17:24:44.412Z
1002049	16	1	1	1100	1	Cig	3	2016-06-23T18:04:21.248Z
1002063	16	2	1	1100	1	Cig	3	2016-06-23T16:22:26.594Z

Inum: 2679 Study: p1156

Summary | Caselist | Interviewers | Import Sample | Data Delivery

1. Create a sample.csv file for your project.
2. Copy that file into the c:\Robot\sample\ directory
3. Press the button.

Begin importing sample for p1156



- Current implementation produces
  - CSV file
  - SPSS syntax file

Monocle 3.0 - Future Features

- Login authentication
  - Menu of authorized projects
- Setup screens
  - Interviewers
  - Summary screen
  - Caselist
- Expand data delivery features
  - User-select subset of records and variables
  - Partial data delivery
- Implement current reports

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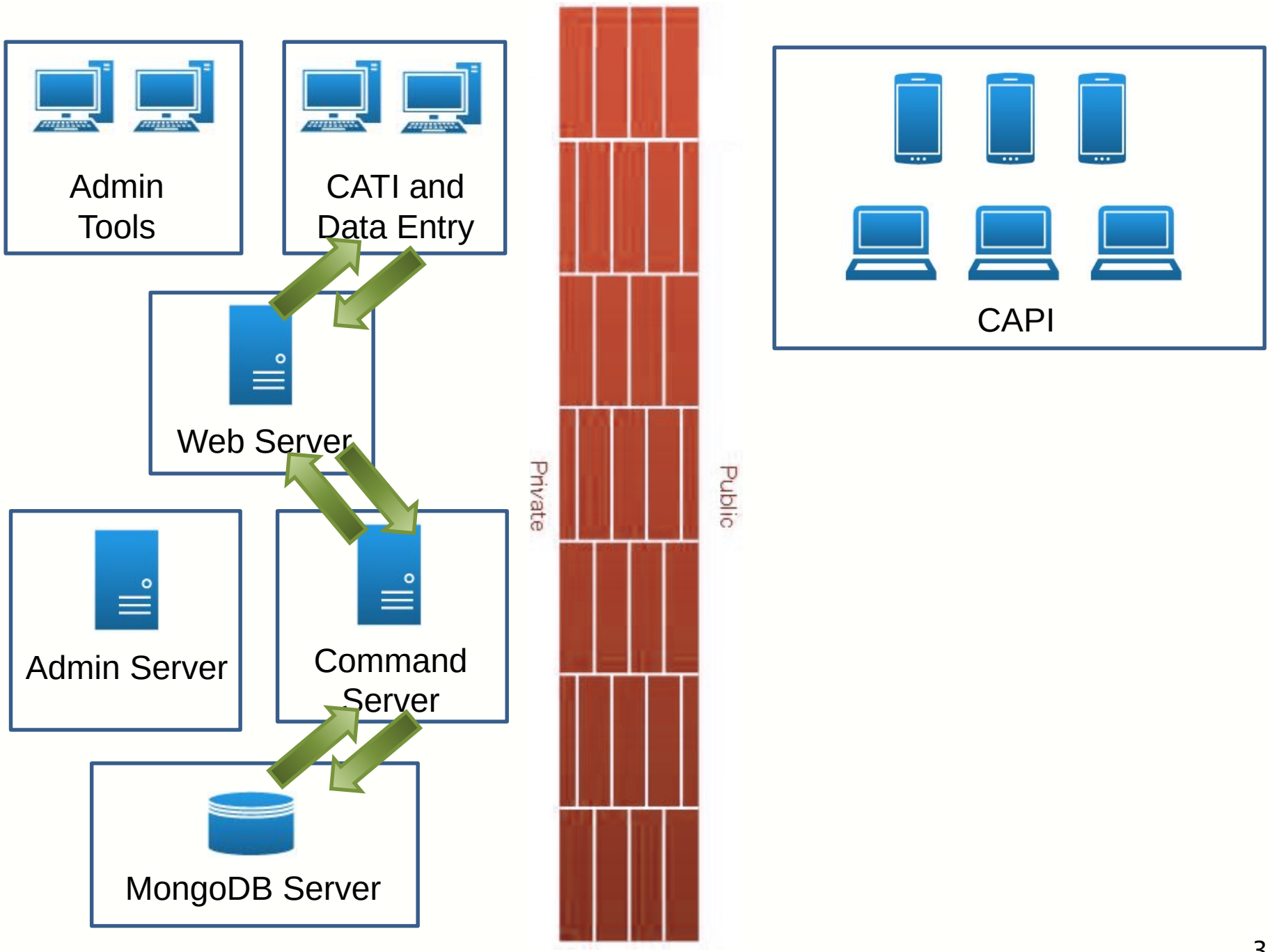
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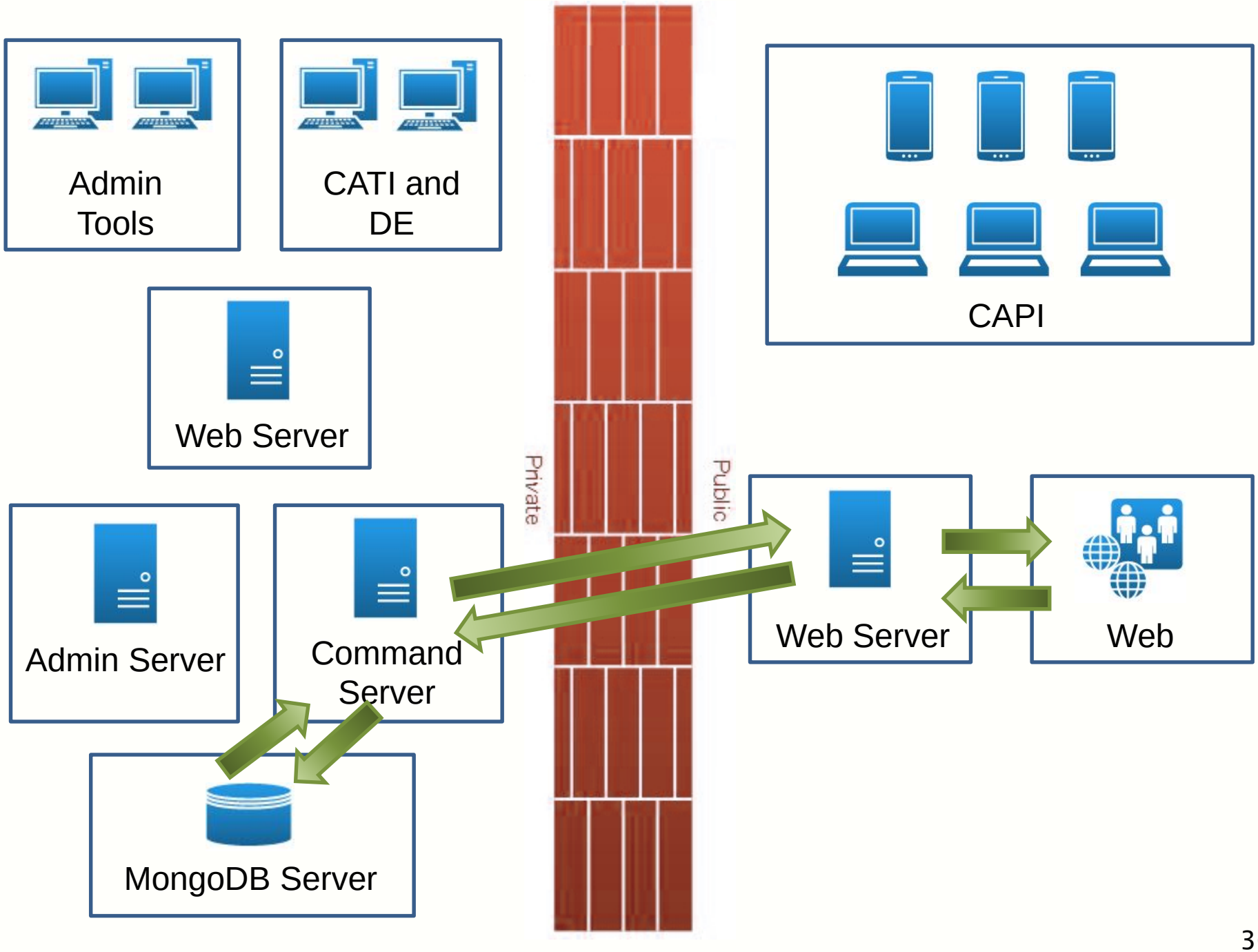
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Server-Side - Future Features

- Existing processes
  - Integration
    - Rapid implementation
  - Redesign
    - Optimize use of NoSQL
      - Data structure
      - Shard data on multiple machines
    - Examine and implement new efficiencies

Acknowledgements

- Steve Bochte
- Brendan Day
- Jaime Faus
- Kate Krueger
- Marie Nitschke
- Augie Salick
- Eric White

Tech Showcase – Session 10F

Join us for a hands-on demonstration!

Tech Showcase
3:15 pm – 4:30 pm

Thank You!

For copies of this presentation or more information, contact:

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cschlapper@ssc.wisc.edu

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