

MICHIGAN STATE

U N I V E R S I T Y

Project Plan

Investment Portfolio Construction

The Capstone Experience

Team Principal IPC

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*From Students...
...to Professionals*

Functional Specifications

- Principal's current process involves hard-coding parameters to generate a single type of investment portfolio construction
- Our application provides a user interface for saving and loading optimization parameters and passing them to Principal's existing optimization engine
- The application assigns groups to its users, providing them with the ability to construct a variety of portfolio constructions based on custom-built portfolio-level and quantile-level constraints

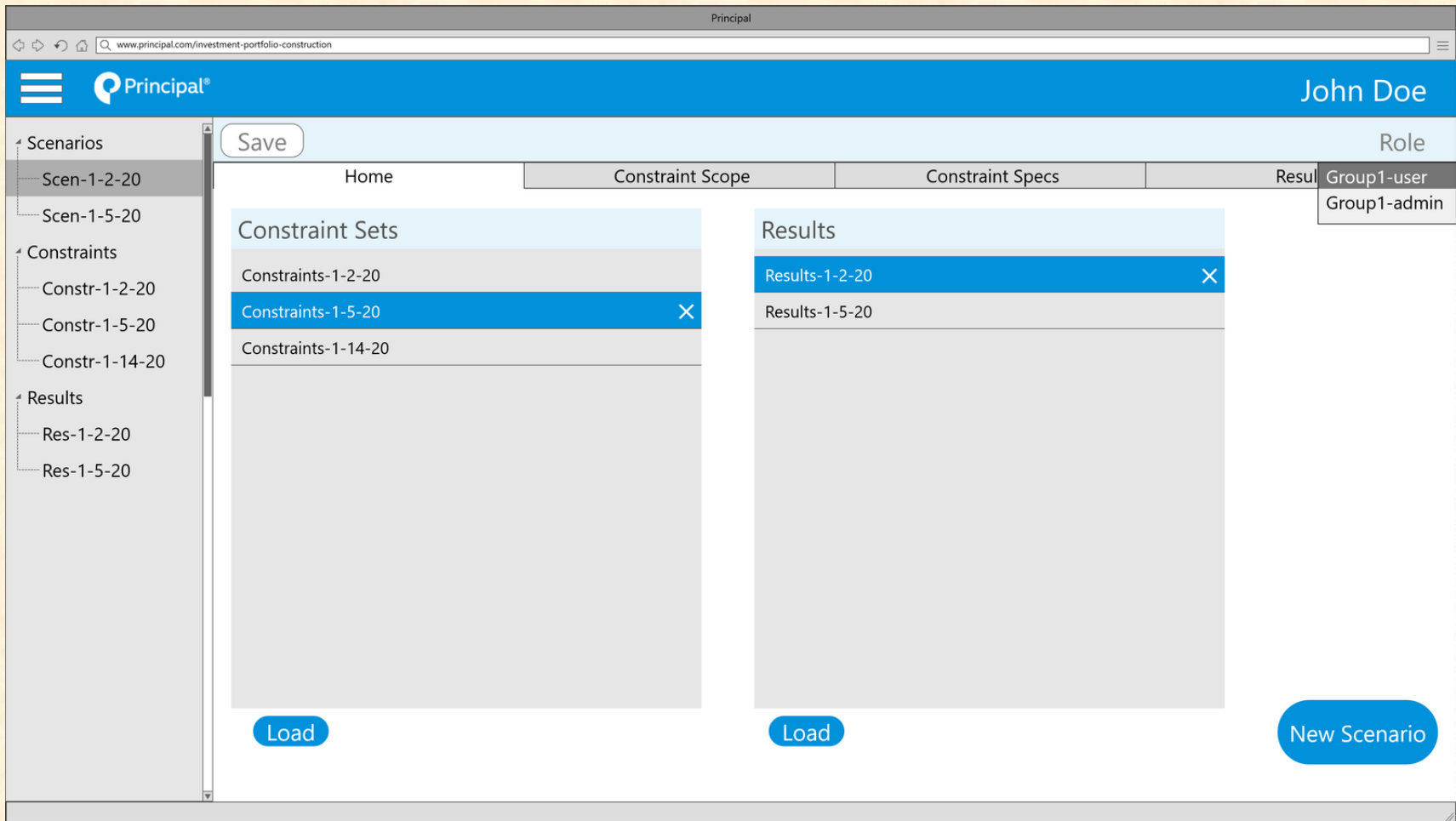


Design Specifications

- Landing Page: View any constraint sets or results saved for specific user/group
- Constraint Scoping Page: Create the basis for user constraints in a portfolio construction scenario
- Constraint Specification Page: Configure specific settings for each of the constraints defined on scoping page
- Results page: Displays the investment portfolio construction returned by the optimization engine



Screen Mockup: Landing/Home Page



Screen Mockup: Constraint Scoping

The screenshot shows a web browser window with the URL `www.principal.com/investment-portfolio-construction`. The page header includes the Principal logo and the user name "John Doe". Below the header, there is a navigation bar with tabs for "Home", "Constraint Scope", "Constraint Specs", and "Results". The "Constraint Scope" tab is active.

At the top of the main content area, there are three dropdown menus: "Select Level...", "Select Type...", and "Select Signal...". To the right of these menus are two radio buttons labeled "Absolute" (selected) and "Benchmark", and a blue "Create" button.

Below the dropdowns, there are three tables:

- Grouping Constraints:**

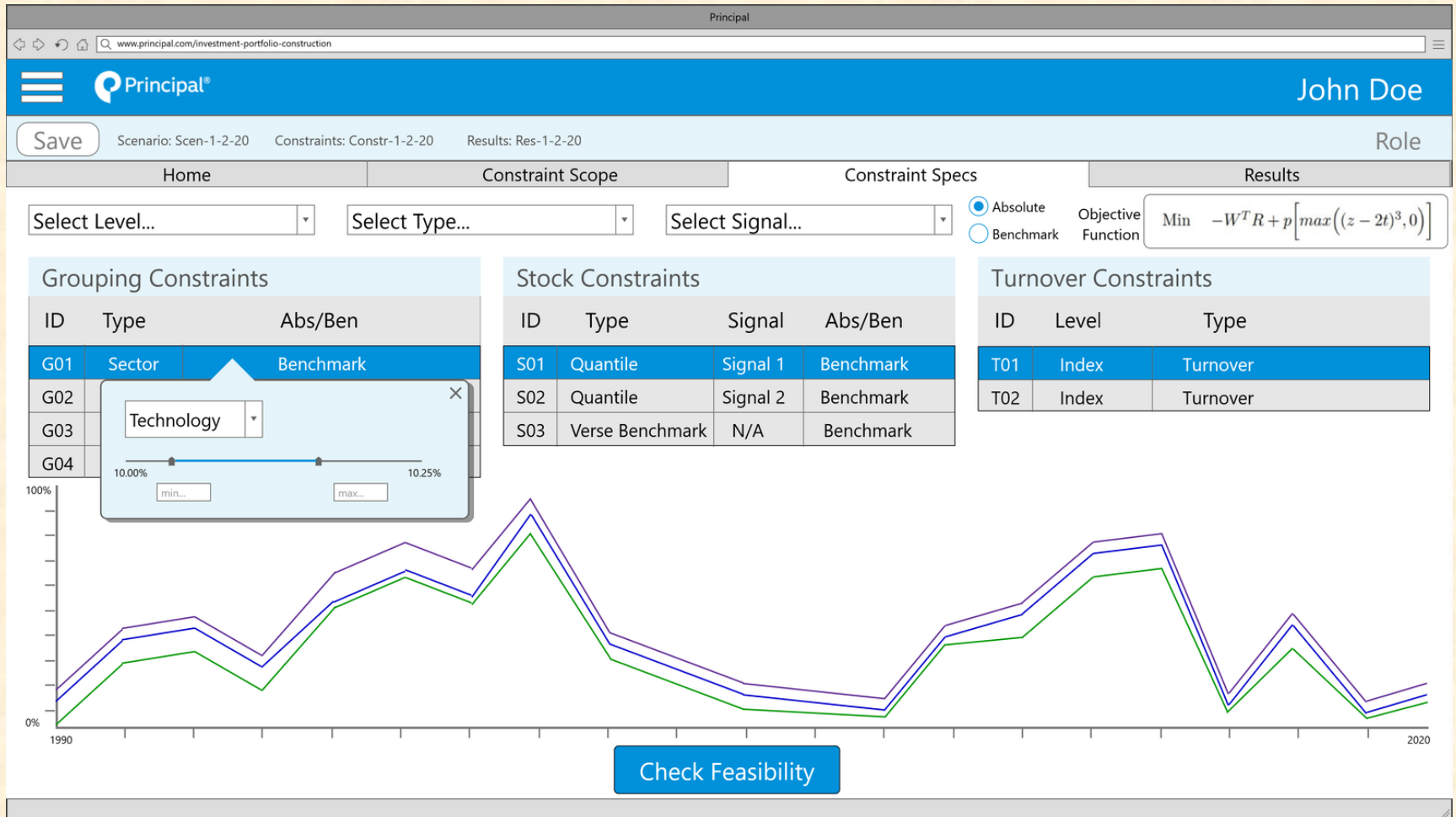
ID	Type	Abs/Ben
G01	Sector	Benchmark
G02	Sector	Benchmark
G03	MACP	Absolute
G04	Beta	Absolute
- Stock Constraints:**

ID	Type	Signal	Abs/Ben
S01	Quantile	Signal 1	Benchmark
S02	Quantile	Signal 2	Benchmark
S03	Verse Benchmark	N/A	Benchmark
- Turnover Constraints:**

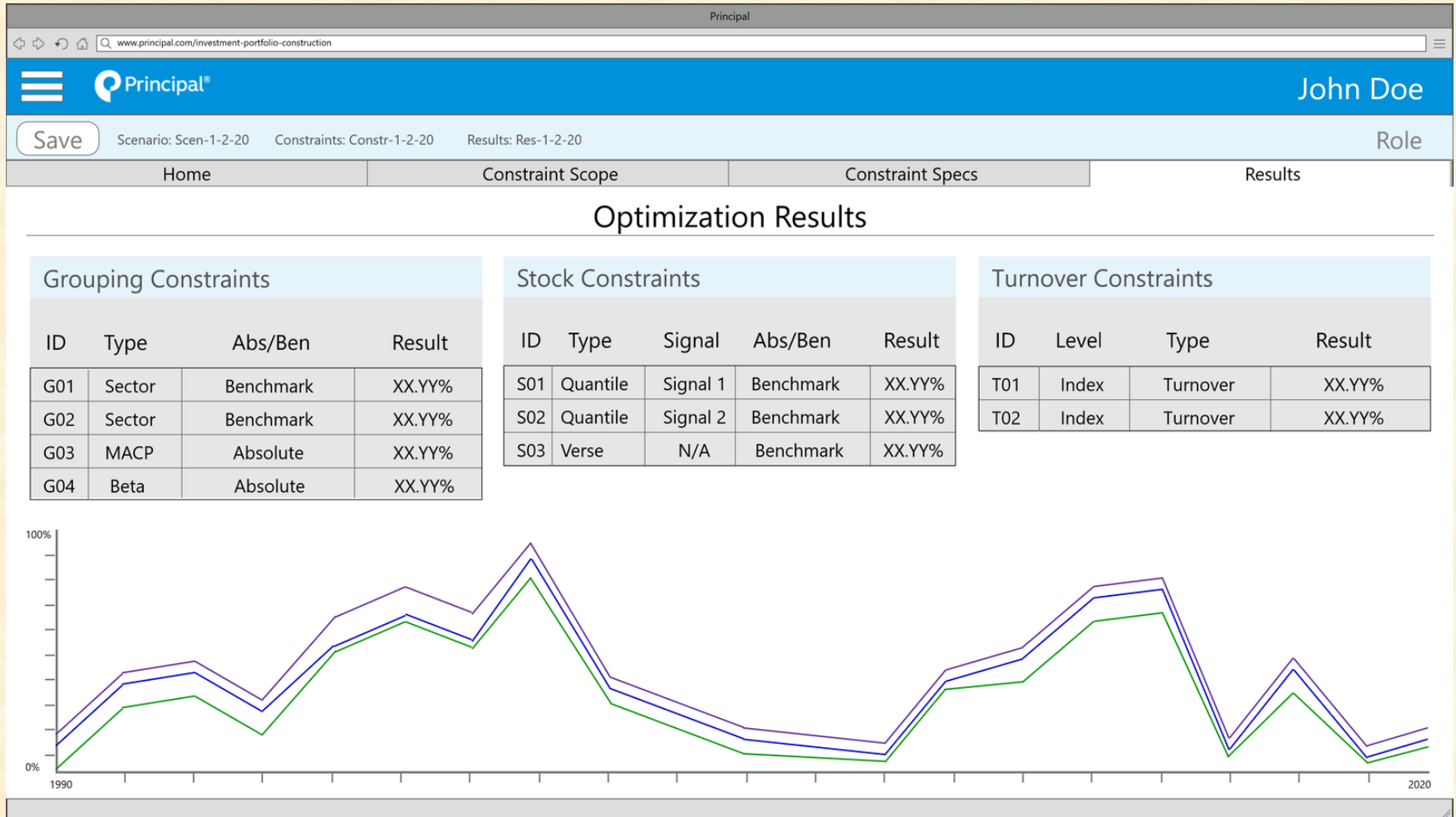
ID	Level	Type
T01	Index	Turnover
T02	Index	Turnover



Screen Mockup: Constraint Specifications



Screen Mockup: Results

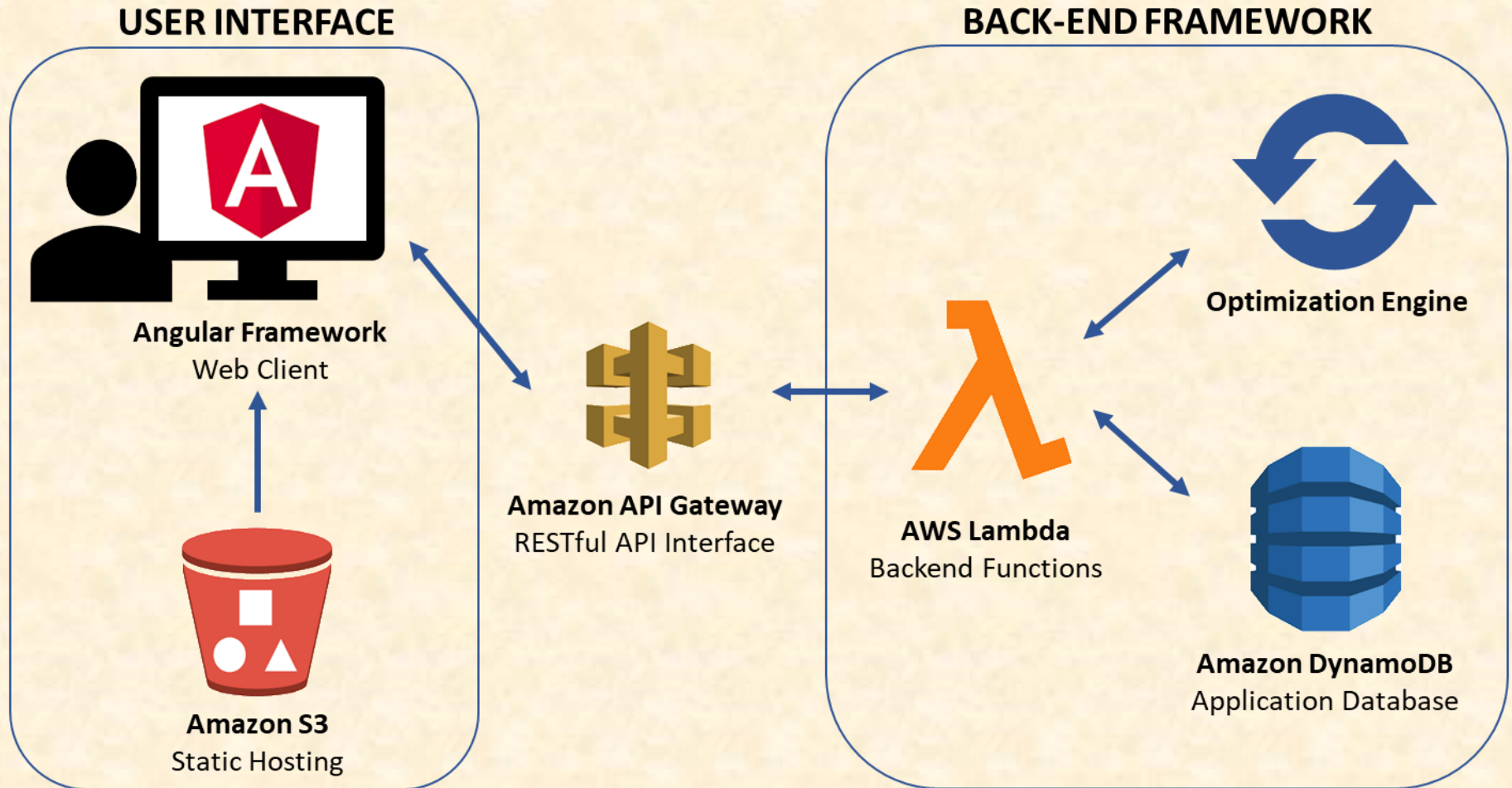


Technical Specifications

- **Connection to the optimization engine and database:** a method is required for passing constraints, objective functions, and data into the optimizer
- **Constraint and objective function builder:** programmed equations let users create and store new objective functions and constraints
- **User interface:** users on the front-end can interactively specify constraints that can be saved into databases and loaded for future use



System Architecture



System Components

- Hardware Platforms
 - Computer interface required to use application
- Software Platforms / Technologies
 - Angular (implement user interface)
 - AWS S3 (host Angular application, store and retrieve local data)
 - Amazon API Gateway (link between front-end and back-end)
 - AWS Lambda (provide an environment for combining and returning the results of database queries to the front-end)
 - AWS DynamoDB (store data)



Risks

- **Compatibility with Principal's optimization engine**
 - Method for passing all data to optimization engine must be compatible with current process for accepting data
 - We are working with the client so that the method can be tested early and often directly on their optimizer
- **Serverless Architecture Model (SAM)**
 - Neither system parts nor communication can be dependent on servers
 - We are separating static elements and dynamic elements before implementation
- **API Gateway**
 - All data exchanged between user interface and back-end platforms must be passed through an API gateway designed by the team
 - We are using test functions to ensure gateway can reliably pass mock data between all necessary system components
- **Compatibility with other Principal team's user model**
 - Assignment to worldviews relies on implementation of user groups
 - We are working with Principal to understand the format of user group data



Questions?

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