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# Database Driven Scenario Development

## Automating Application Creation for AR and PC

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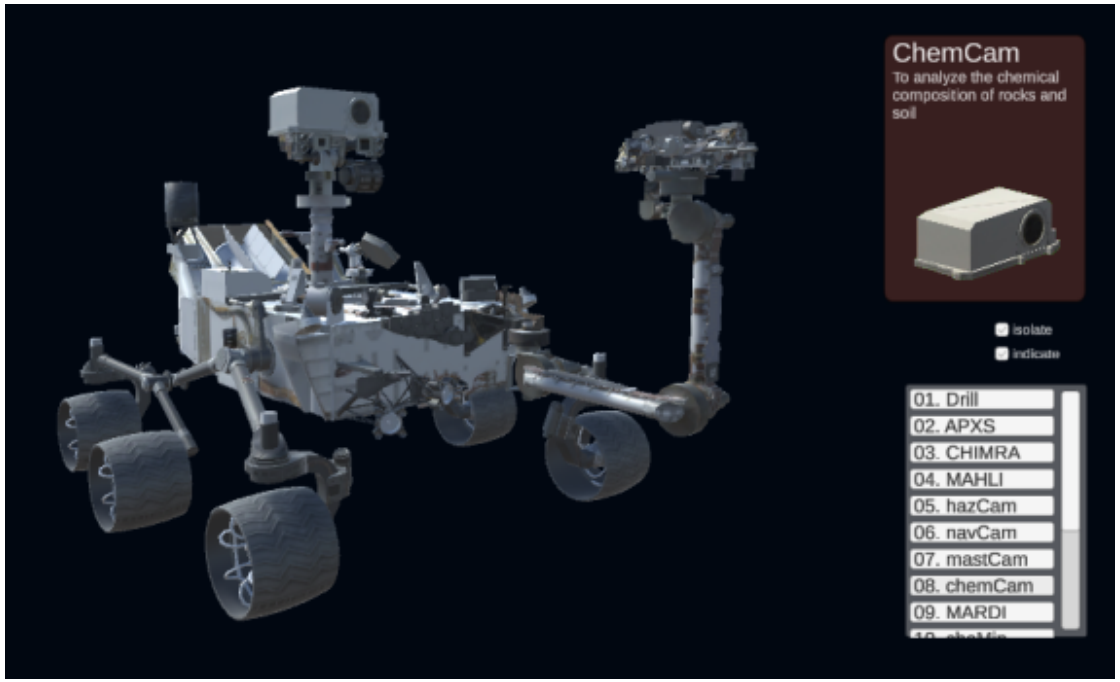
# Presentation Overview

- Description of our Database Driven Design philosophy
- Why use a database driven pipeline
- Overview of our process
- Organization of the model set in Maya
- Creating the corresponding CSV files
- Demonstration of Curiosity Rover PC and AR applications
- Future development goals
- Questions

# Our Database Driven Design philosophy

- Creating applications that are intended as a teaching aid to convey information beyond standard CAD metadata
- Creating CSV file along with an organized 3d model set to drive actions and information display in the applications
- Consistent outcomes between models, customers, projects
- Ability to make changes seamlessly and maintain over time



# Why use a database driven pipeline?

Faster Development & Deployment

Reduce the Need for Expert Labor

Reduce Human Error and Labor

Make Applications Modifiable & Maintainable

# How it changes the pipeline

The Optimization stage now includes organizing the geometry into a readable format as well as spawning the CSV files that correspond to it.

During development the C# scripts in Unity are used to read the CSV files, generate appropriate UI elements, and perform manipulations.

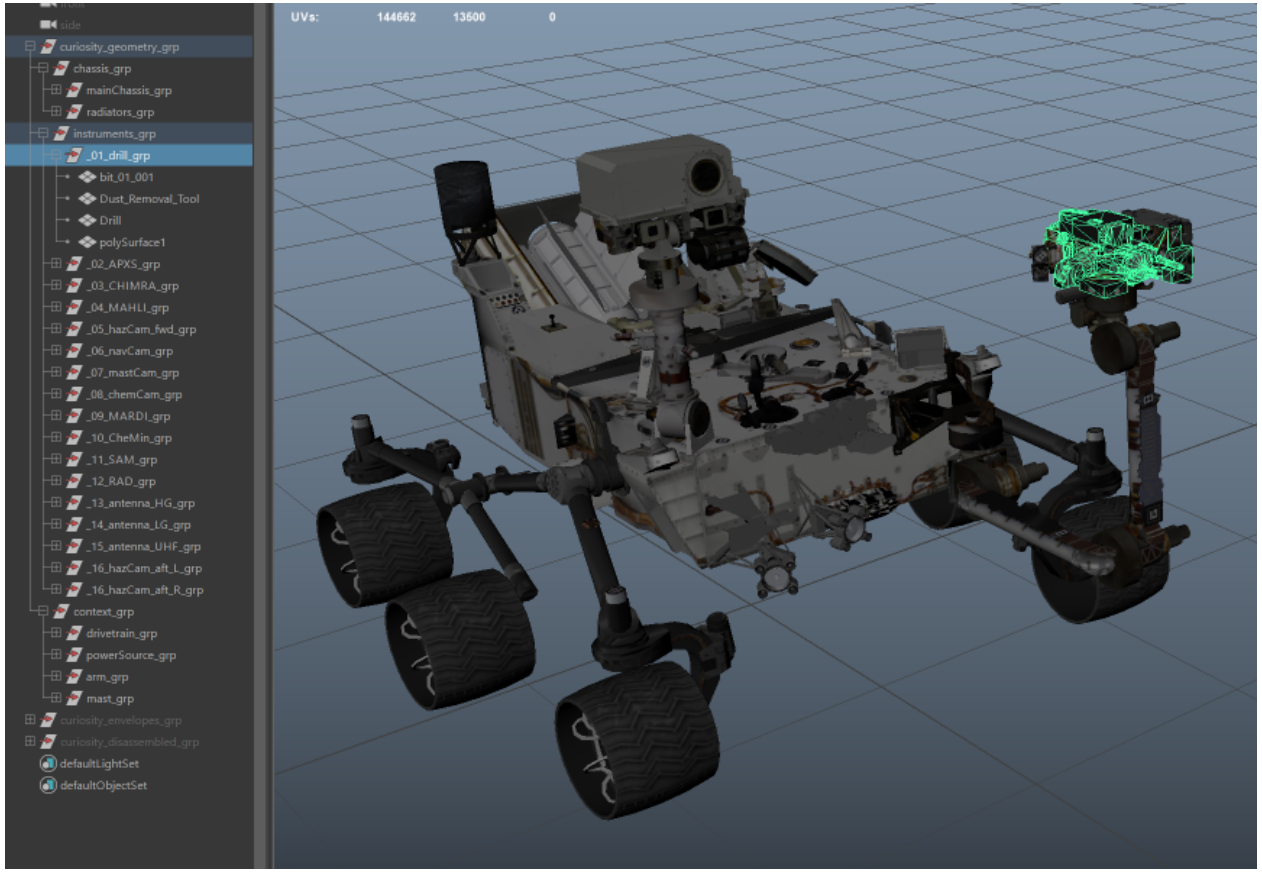
## Pipeline Summary

How we get useable applications to our customers:

- Ideation and Planning
- File Management
- Asset Acquisition
- Optimization
- Asset Generation
- Application Development
- Testing and Feedback
- Final Delivery

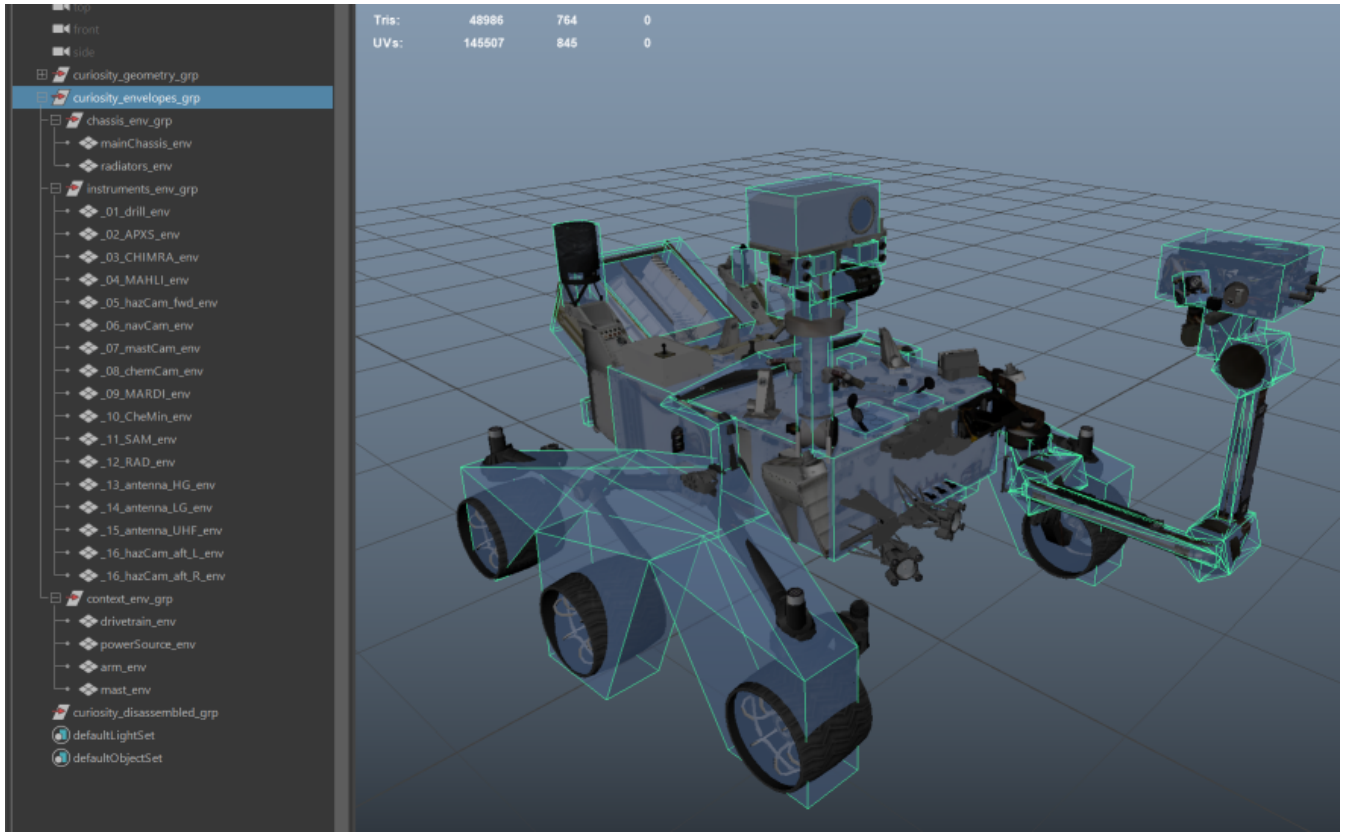
# Preparing and Organizing the Model

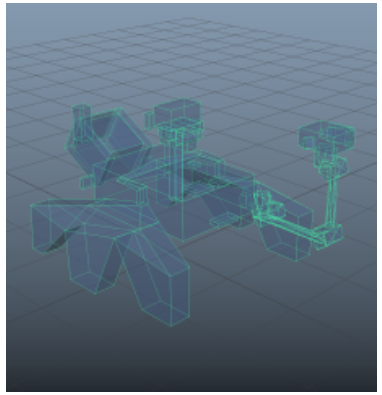
- Optimization
  - Models need to be clean
  - Textures created
- Organization
  - Sort components into groups based on the needs of the customer
  - 3 Main Groups
    - Outer Housings
    - Instruments
    - Contextual Parts
- Using groups allows us to flexibly change geometry when making updates

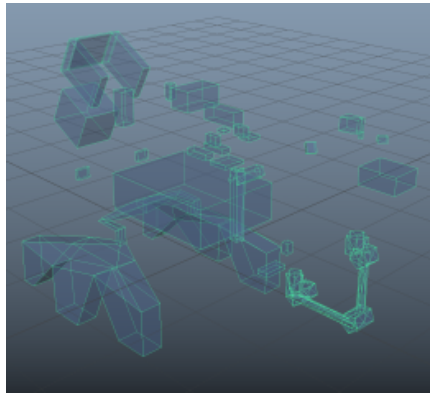


# Collision Envelopes

- Generate envelopes
  - Used as the collision mesh and parent in Unity
- More precise than generic capsule colliders
- Can be used to define alternate positions and orientations





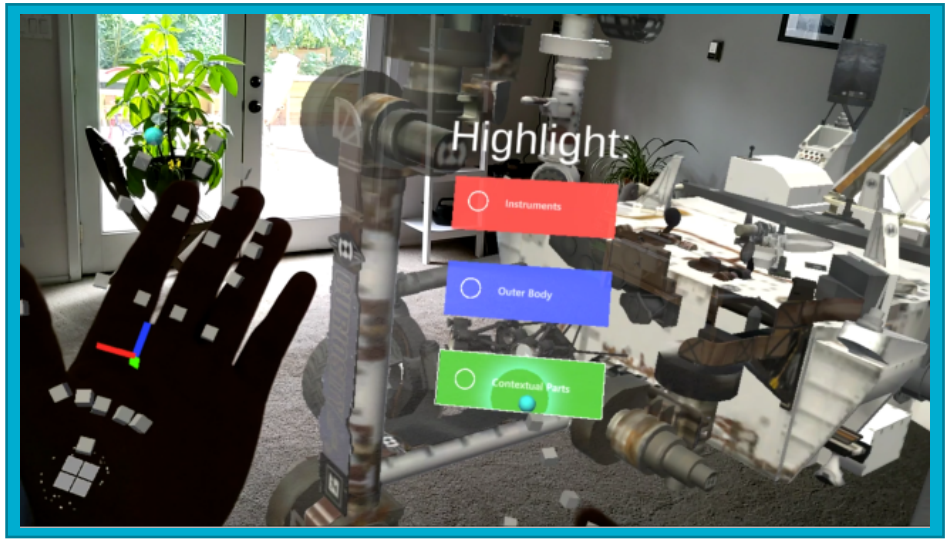
# Creating the corresponding CSV file

- CSV file contains information for object type
  - i.e. information, housing, context or more
- Contains hierarchical relationships for dynamically reparenting groups in the application
- Can contain additional information that will be displayed
  - Descriptions, names, part numbers etc.

| | A | B | C | D |
|---|---|---|---|---|
| 1 | geo name | section level | assembly level | component level |
| 2 | **mainChassis_grp** | **mainChassis_env** | **mainChassis_env** | **mainChassis_env** |
| 3 | radiators_grp | **mainChassis_env** | **mainChassis_env** | radiators_env |
| 4 | _01_drill_grp | arm_env | _01_drill_env | _01_drill_env |
| 5 | _02_APXS_grp | arm_env | _01_drill_env | _02_APXS_env |
| 6 | _03_CHIMRA_grp | arm_env | _01_drill_env | _03_CHIMRA_env |
| 7 | _04_MAHLI_grp | arm_env | _01_drill_env | _04_MAHLI_env |
| 8 | _05_hazCam_fwd_grp | **mainChassis_env** | **mainChassis_env** | _05_hazCam_fwd_env |
| 9 | _06_navCam_grp | mast_env | _08_chemCam_env | _06_navCam_env |
| 10 | _07_mastCam_grp | mast_env | _08_chemCam_env | _07_mastCam_env |
| 11 | _08_chemCam_grp | mast_env | _08_chemCam_env | _08_chemCam_env |
| 12 | _09_MARDI_grp | **mainChassis_env** | **mainChassis_env** | _09_MARDI_env |
| 13 | _10_CheMin_grp | **mainChassis_env** | **mainChassis_env** | _10_CheMin_env |
| 14 | _11_SAM_grp | **mainChassis_env** | **mainChassis_env** | _11_SAM_env |
| 15 | _12_RAD_grp | **mainChassis_env** | **mainChassis_env** | _12_RAD_env |
| 16 | _13_antenna_HG_grp | **mainChassis_env** | **mainChassis_env** | _13_antenna_HG_env |
| 17 | _14_antenna_LG_grp | **mainChassis_env** | **mainChassis_env** | _14_antenna_LG_env |
| 18 | _15_antenna_UHF_grp | **mainChassis_env** | **mainChassis_env** | _15_antenna_UHF_env |
| 19 | _16_hazCam_aft_L_grp | **mainChassis_env** | **mainChassis_env** | _16_hazCam_aft_L_env |
| 20 | _16_hazCam_aft_R_grp | **mainChassis_env** | **mainChassis_env** | _16_hazCam_aft_R_env |
| 21 | drivetrain_grp | **mainChassis_env** | drivetrain_env | drivetrain_env |
| 22 | powerSource_grp | radiators_env | powerSource_env | powerSource_env |
| 23 | arm_grp | arm_env | arm_env | arm_env |
| 24 | mast_grp | mast_env | mast_env | mast_env |
| 25 | | | | |

# Curiosity Rover Example

- AR and PC application displaying NASA's publicly available assets
  - Shows the form and location of various instruments on the Curiosity Rover
  - Sources information and categorization from NASA's educational websites
  - Demonstrates how the ARIA pipeline can be used to create useful and educational apps for PC and HoloLens for complex geometry.

# Future Goals and Improvements

- **How can we automate repetitive tasks?**
- In Maya (python and MEL)
  - Ensure that geometry and envelope names match correctly
  - Export geometry group names and envelope names directly into CSV
- In Excel
  - Updates between CSV files
- In Unity (C#)
  - Generation of UI from CSV
  - Information displayed as live text and populated from CSV
  - Descriptive error message throws
    - Reduce time to identify errors in database or geometry
  - Merge development of PC and AR applications into a single Unity project

# Questions