REAL ESTATE BROWSER

A design interface for browsing local real estate listings

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TCSD Portfolio

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REAL ESTATE BROWSER

A desktop app for browsing real estate listings

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TCSD Phase 0: Background

Background

The Client

Realtor.ca has contracted our company, 5PeopleAndACat Inc., to develop a new interface for their real estate browser. The site has over 230 million users a year and provides services such as a mortgage calculator, the ability to contact local realtors, and public property listings. These listings are stored in a database and shared between different sites, as realtor.ca has a reciprocity agreement with other companies and individual realtors. This back-end system is adequate and will not be replaced.

However, realtor.ca's user interface is cluttered and inconsistent across different browsers. A new system is needed to solve these problems and provide a better user experience, thereby attracting more customers to the site. Potential users are not obligated to use this system when they can view the same listings on any other real estate site.

Technology

Realtor.ca's current browser is on a website built with HTML5, CSS, JavaScript, and ASP.NET. Oracle DB is used to store all of their listings and user information. The full stack is hosted on Amazon Web Services.

Sources: Realtor.ca and a phone interview with Ray Riley (www.rayriley.com)

General Expectations

Realtor.ca would like to replace their browser-based system with a downloadable piece of software. Both the company and its clients expect the new program to be fast and uncluttered, with features that are easy to learn and use. Users should be able to specify the details of the homes they are interested in, view the profiles of homes matching their specifications, and save their favorite homes. The system should also include a way of contacting realtors so that

users can send their “favorites” to a realtor. Houses, apartments, and condos are expected to be handled by the system, while rental properties will be excluded.

System Constraints

Financial and Technical

A budget of $1,000,000 has been allocated to our team for this project. There is a time constraint of around 8 weeks to design and complete the system. It must be coded in C#, which makes developing a cross-platform application infeasible. The system must also have access to an internet connection and communicate with the MLS database.

TCSD Phase I: Identification

Expected User Types

We are creating a browser for Canadian real estate listings. As such, we expect our system to be used by individuals who can be split into typical, occasional, and unusual users types.

Typical

Realtors are the typical users of this system. They require frequent access to sites like realtor.ca to search for properties for their clients, to create property listings for their clients, or to simply assess the marketplace.

Occasional

Direct buyers and sellers. These users can range from singles to couples to very large families. They may have any career and come from any economic background.

Unusual

Direct buyers and sellers with unusual requirements. This includes buyers with physical disabilities, international buyers, and those who are selling unusual properties.

We can expect users who are realtors to be very knowledgeable about real estate jargon and have basic computer skills. They will know how to assess properties based on various criteria. Non-realtor users can also be expected to have some basic computer skills and know

at least some real estate terminology. As members of the 21st century, they are expected to be familiar with search functions like those found on e-Commerce sites.

Source: A phone interview with Ray Riley (www.rayriley.com)

Work Contexts

Realtors

Realtors act as agents for the sale and purchase of homes. They are typically well-informed about every aspect of what a buyer is looking for in a home. They find homes that meet a buyer's criteria and can be experienced in negotiating deals within a buyer's price range. They also list homes for sale on the market and show those homes to prospective buyers.

Direct Buyers

Direct buyers are people who are looking to purchase a home. They can be new buyers, upsizers, or downsizers. They usually have some criteria which their new home must meet. These can include: community, size, budget, and more. Buyers typically search for homes with these criteria in mind, whether they use real estate websites or a realtor.

Concrete Task Examples

Task Example 1

Ian McKenzie is a 22-year-old student at the University of Calgary who currently works in downtown Calgary, on Stephen Avenue. After he graduates in Winter 2018, he wants to move into a starter apartment or condo with one bedroom and one bathroom that is either downtown (near the Beltline) or in Kensington. Living in one of these locations would shorten Ian's work commute, as he takes the C-Train, and place him near trendy restaurants, bars, and shops. Ian would also like the apartment/condo complex to have a gym and other recreational amenities, but this is not a dealbreaker. His budget is around $300,000.

As Ian is not a native Calgarian, he would prefer to use a system that displays search results in a "map view" and supports advanced search parameters. This would ensure that he only

considers homes that are close to work and/or the C-Train and that are also within his budget. He does not want to waste his time.

When Ian browses through real estate listings, he narrows his search to only include homes that fit his criteria. He then looks through his filtered search results. If he sees a home that he likes, he selects the listing to view more details about the home - and if he still likes the home after that, he marks down the address and price for future reference. Then, Ian returns to his other search results and continues looking through them. From time to time, he changes his search parameters to get more results.

Task Example 2

Omar and Hanan have been married for 5 months and are currently renting a home in Temple, Calgary as they search for a house to buy. Hanan is a 22-year-old mobile bridal hair stylist and Omar is the 34-year-old owner of Almira's Mediterranean Grill in Okotoks. Since Hanan's work is mobile and Omar works outside of the city, they want to live near a major road such as Stoney Trail or Deerfoot Trail to improve their commutes in and out of the city. The couple's budget is $500,000 to $700,000, but since they plan on renovating their new home, they hope the price will be closer to $500,000 to have leftover renovation money.

Omar and Hanan would like their home to be located in southeast Calgary, and have focused their search on the communities of Douglasdale, Canyon Meadows, Lake Bonavista, and McKenzie Towne. They want to avoid newer communities because the houses are too "cookie cutter", built too close together, and have small yards (e.g. Aspen and Cranston). They also want to live in a family-oriented community to avoid crime, as they plan on staying in their new home for many years and raising a family there.

What is mainly important to them is the layout of the home. They are very specific about what they are looking for and some of their specifications include: a 2 story house with 2,000-2,500 square feet, a basement, an open layout (no walls between kitchen and living area), a large kitchen with room for an island, a fireplace, 5 bedrooms (4 upstairs and 1 in the basement), 4 bathrooms (2 upstairs, half bath on main floor, and one in the basement), a large

backyard (0.10-0.15 acres), a double garage (preferably attached to the house), and an alleyway.

When Omar and Hanan browse real estate listings, they begin by searching for homes based on their location (i.e. southern Calgary and communities they like). The couple further specifies their search parameters according to their other criteria and once the search is completed, they sort the listings from cheapest to most expensive. Next, the couple looks at the houses whose prices have been reduced, as they want a good deal on their home to save money for the renovation. As they go through the listings, they select any homes that interest them to view more details about the homes. The couple saves the listings they like the most for future reference. Their top favorites are shown to a realtor so that the couple can go see the homes and the realtor can find similar homes for them to consider.

Hanan prefers using a system with a “listings view” instead of a “map view” because she is very familiar with Calgary and doesn't need a map to know where homes are. One thing the couple doesn’t like is that they need to visit every real estate website to see their listings. They would like to use a site that has every listing in Calgary, so that searching could be a "one-stop shop."

Task Example 3

Alice and Bob are a retired couple looking to downsize. They are looking for a house that is located north of Downtown Calgary and is on a quiet street. They would like to move into a bungalow to minimize the number of stairs they have to go up. Alice would like to live near a grocery store or a shopping centre. Alice and Bob are looking for a home that has at least 2 bedrooms, 2 bathrooms, is modern, and ready to move into. They would like to spend around $400,000, but are willing to spend up to $500,000 if it’s the right home for them.

Alice and Bob have basic computer skills so they would like a system that is easy to follow and interact with. Hence, they would prefer a system that is map-based so they can get a good idea of where the homes are located. They would also like the system to allow them to see amenities near potential homes they are looking at.

When Alice and Bob look for homes, they usually print out that properties page and look at it on paper. They print out many pages and compare them outside the system because they feel it is simpler than looking at it on a screen. Therefore, they would like a system that allows them to look at their favourite properties all in one place at the same time. When they decide on the homes they want to visit, they schedule an appointment with a realtor.

Task Example 4

Dominique Birth and Drew Gillson have been living together for several years in a tiny bachelor-oriented house in Ramsay and want to move somewhere larger, newer, and more kid-friendly. Specifically, they are interested in a northwest Calgary starter home with at least three bedrooms, three bathrooms, in the $400,000 - $600,000 price range. They want a large backyard, an open concept design, an attached two car garage, and a bright kitchen.

Dominique uses the following process to research potential properties: she searches for listings by location and price range, then she narrows the results according to available parameters in accordance with her criteria. Next she views several listings and saves the ones she's interested in. Finally, she shares her favourite listings with a real estate agent in order to arrange viewings.

Task Example 5

Michelle is a 58-year-old legal assistant who is looking to buy a property for investment purposes. She would prefer a home with two or more bedrooms and one or more bathrooms in the northwest part of Calgary. Properties in these locations are close to grade schools and the University of Calgary, which is enticing for potential student renters and young families. Her budget is $350,000 to $400,000.

When Michelle browses through real estate listings, she first searches for properties based on their location. She then filters her search with the number of bedrooms and bathrooms, as well as the price. She reviews the results and adds her favorite properties to a list. She does not contact a realtor yet, as she wants to scope out the marketplace.

Michelle dislikes individual realtor websites because they require your contact information to use. Your email address or phone number then gets bombarded with messages. She also dislikes the map view on realtor.ca because the "pins" denoting properties are too close together, with no clear way to zoom in on the map.

Use Case Collection

To create a valid set of user cases we decided to interview individuals we know who are either currently looking for a new home, or have recently undergone the process of buying one. Tyler interviewed his sister-in-law Dominique Birth (Task Example #4). Lamess interviewed her boyfriend Ian McKenzie (Task Example #1) and her cousin Hanan (Task Example #2). Shannon interviewed her mother, Michelle. Saurabh interviewed ???. Victor invented Alice and Bob???. (Do we admit this???)

TCSD Phase II: Tentative List of Requirements

Must Include

- *Custom Search.* All buyers and realtors know what kind of property they are searching for. Since the market in Canada is quite large, there must be a way for users to narrow in on homes that meet certain criteria.
- *Property Profiles.* The core purpose of our Real Estate Browser is to enable buyers and realtors to find and list residential properties. Most buyers will want to see photos and other details about a property before deciding to see it with a realtor. Therefore, our system must enable all users to view property profiles.

Should Include

- *A "Favourites" Feature.* We expect most buyers and realtors to spend a lot of time researching properties in order to make an informed decision on what to buy or what to recommend to a client. Revisiting interesting homes should be made simple with a "Favourite Properties" feature.

- *Realtor-Client Communications.* At some point, all buyers and sellers will need to contact a realtor if they wish to see or list a property. This feature will facilitate said task.
- *Property Comparison Tool.* There are many standard attributes of residential properties that can easily be compared. A side-by-side comparison widget will aid realtors and buyers in comparing attributes across multiple properties.

Could Include

- *Visualization of Important Nearby Locations.* While traditional listings already include this information in text descriptions (e.g. “near several schools and malls”), a picture is worth a thousand words. Location is important to most buyers and therefore the realtors who suggest homes to these buyers. With this in mind, making property locations prominent is a reasonable feature to include.
- *Crime Map Overlay.* Safety is important to most buyers and therefore the realtors representing these buyers. Visualizing crime rates on a map view would make it easier to assess the safety of a neighbourhood.

Exclude

- *Rental Properties.* Our system is geared towards those who want to buy or sell houses, apartments, and condos. The inclusion of rental properties is beyond the intended scope of the system.

TCSD Phase III: Prototyping

Process of Evolution

We made a few observations during our alpha prototype walkthroughs that led to some iterative design changes. The biggest change was the removal of user accounts. As our system will be a desktop app, user data can be stored locally and there is no need for accounts. User profiles are best-suited for an online system that needs to store individual

account information (e.g. favourites and search history) onto a back-end database. We felt that removing the login system would increase user motivation because they could start using the app right away.

To maintain this motivation, four new startup screens were created to ask for the most common search criteria and generate an initial list of search results. It would annoy users to have to enter information that did not interest them, so we separated the basic and advanced search parameters. This decision reduced the “information overload” on certain screens and decluttered the interface, which is important to our team.

Designing a system that is visually simple was the driving force behind our other changes. We decided to group most of the browser’s tools (e.g. realtor contact and home comparison) together on each “home profile” screen and represent these tools as simple icons. Important details on each profile (e.g. number of bedrooms and bathrooms) are also represented as icons, to make homes easier to compare. We also made our map view as unobstructed as possible. As of now, we have a toolbar in the bottom left corner that only appears when hovered over.

All of these changes, taken together, helped us to develop the final prototype.

Final Prototype

TCSD Phase IV: Task-Centered Walkthroughs

Task Example #1 - Ian McKenzie

Storyboard

<insert storyboard here>

Walkthrough

Step	Step Description	Does the user have the knowledge to do this step?	Are users motivated to do this step?	Comments or solutions for this step
1	Open the app for the first time, which brings the user to the home screen.	Yes. He is proficient with computers and knows how to open an application.	High motivation. Ian wants to browse home listings and is motivated to use the application.	
2	First page asks the user to “enter your location”.	Yes. He knows what location he is searching in.	High Motivation. He wants to browse homes within a certain location.	“Enter your location” should be “Enter a location”, and he believes selecting the geo-locator button should allow him to search all listings nearby and not have to continue answering questions.

3	Enters location.	Yes. Proficient with computers, can type well, and knows the location he wants to search.	High motivation. Wants to search homes in a specific location.	
4	Hits “Go” button to proceed.	Yes	High motivation.	
5	The first of four basic search questions appears on the screen. Asks about the type of home the user is searching for.	Yes. Ian knows he is searching for an apartment or condo.	Motivation medium. He can see that he is only on the first question of four on the progress bar.	By making the questions simple, it takes little time to answer them. However, this is still tedious.
6	Makes selection from the dropdown menu. Hits “Next” button.	Yes. Ian knows how to select an option using a dropdown menu.	Motivation medium, he is still on the first of four questions.	Would like to search for an apartment or a condo. Does not like that he is only allowed to select one option.
7	The next screen asks how many bedrooms the user is looking for.	Yes. He knows how many bedrooms he is looking for in his apartment/condo.	Motivation still down a little because he sees he is only halfway through the questions.	

8	Selects a number of bedrooms and hit "Next."	Yes, knows that he must make a selection by clicking the number of bedrooms he is looking for.	Motivation still medium as he is still only halfway through the questions.	Would like to search for homes with 1-2 bathrooms, and does not like that this basic search is only allowing him to select 1 or 2 bedrooms, or a studio suite.
9	The third question asks about the number of bathrooms the user is looking for.	Yes. He knows he is looking for only 1 bathroom.	Motivation increases a little because he sees he's getting closer to finishing the questions.	
10	Selects his answer by selecting the bubble next to a number of bathrooms and hits "Next."	Yes. He knows how to select his answer from the previous question.	Motivation at same state.	Would like to have the ability to select more than one option for number of bathrooms, or have the option of making no selection and view them all.

11	The final question asks for the user's budget by asking the user to type a minimum and maximum budget, then hit "Go" to see results.	Yes. Ian knows his upper bound on his budget is $300,00 and has no minimum price. He is proficient with typing.	Motivation is high because he has answered the last question according the progress bar.	Steps complete. But could this be too many questions if his motivation is going down as he answers them?
12	The basic search is complete and a map with the basic search results appears on screen.	Low knowledge. Is not familiar with this system and is unsure what the various kinds of pins mean. Does not know how to view homes in more detail yet.	Motivation is medium because he has to learn how this application works, but he is proficient with computers and a fast learner so he is motivated to learn.	The layout of the system may be overwhelming at first. The different kinds of pin meanings and how to see homes in more detail is not immediately obvious.
13	User clicks on one of the pins and a window with minor details pops up.	Medium knowledge. Knew that clicking on pins would do something. Now knows it reveals minor details.	Motivation is higher, he now knows how to see minor details and is motivated to see more about the homes.	Could hovering be a better solution? Hovering can make too many minor detail windows pop up, one click makes more sense.

14	Doubleclicks to view detailed view of the home listing.	Low knowledge. Ian did not know that he needed to doubleclick to see more details about the listing, thought he should be able to click once anywhere in the window and get more details.	Motivation medium. Wants to browse homes, but would never think to doubleclick.	Could make this a single click anywhere in the window to see more information, or click on the information icon. Doubleclick did not make sense to Ian.
15	Window opens on top of the map and a detailed listing of the home is shown.	High knowledge. Ian knows what he is looking for in a home and the details on this page help him decide if he likes this one or not.	Motivation is high, he now knows how to view homes in more detail.	
16	Closes overlay window with more details. Returns to the map view.	High knowledge. Closing a window with the “x” in the corner is a standard way of closing a window.	Motivation high. Is interested in resuming browsing and seeing more results.	Overlay that goes back to map is good as he does not have to restart his search to see the same results.

17	Hovers over bottom left corner to reveal taskbar for changing search options.	Low knowledge. Would not have known that there was a task bar there before hovering over it.	Motivation medium, wants to change search options and is willing to figure it out, but a hint that it was there would have been helpful.	Allow part of the task bar to be displayed in the corner so the user knows it is there.
18	Clicks on bedroom icon and selects a new option.	High knowledge, knows that by clicking the bedroom icon he will be able to change his bedroom search parameter.	Motivation high, wants to view homes that have a different number of bedrooms than what he initially searched for.	Enjoys being able to change search parameters without leaving the screen.
19	New search results appear on the map for user to view.	High knowledge. Knows that the new search parameters have changed what pins are appearing in the map.	Motivation high, wants to view the homes with his new search.	
20	Clicks a pin and views minor details about it.	High knowledge. From previous experience with the interface, he now knows this brings	Motivation high. He now knows how the system works and is able to use it more easily.	System may have too much of a learning curve. An introduction tutorial at the beginning may be

		up minor details about the home.		useful for new users.
21	Double clicks a pin to view major details in the overlaying window.	High knowledge. Now Ian knows that a double click will make the detailed view appear on screen.	Motivation high. Knows how to use the system and wants to view more details about homes.	Still is not a fan of the double click, but now knows how to use it.
22	Clicks the heart icon on the listing to add it to his favorites.	High Knowledge. The heart icon is pretty universal for “Favorites” so this makes sense to Ian.	Motivation high. Wants to be able to add to favorites because he likes the home and wants to be able to see the listing again later.	
23	View favorites by clicking favorites in lower left corner taskbar	Medium knowledge. Wasn’t aware that he has to go to this taskbar to go to the favorites page.	High motivation, wants to be able to see all the homes he has put in his favorites so far.	Would like there to be a way to navigate to the favorites page on all pages, having to go back to the map does not make sense to the user.

Task Example #2 - Hanan and Omar

Storyboard

<insert storyboard here>

Walkthrough

Step Number	Step Description	Does the user have the knowledge to do this step?	Are user motivated to do this step?	Comments on solutions for this step
1	Open the app for the first time, which brings the user to the home screen of the application.	Yes. They are proficient with computers and know how to open computer applications.	High motivation. Hanan and Omar are eager to begin their search for a new home and stop renting.	Opening of the application is easy.
2	First page asks the user “enter your location”.	Yes. Hanan and Omar are very specific about the locations they want to browse in and know exactly where to search.	High Motivation. Since location is the most important thing to the couple, they are motivated to answer this question.	Location is very important to the couple and so they are pleased to see that this is the first thing the application asks them when they open it.
3	Enters location.	Yes. They are proficient with computers, can type well and know what location search.	High motivation. They want to search homes in a specific location.	
4	Hits “Go” button to proceed.	Yes	High motivation. Want to get going with their search,	

5	The first of four basic search questions appears on the screen. Asks about the type of home the user is searching for.	Yes. They know they are looking for a house.	Motivation medium. They see they are on the first of 4 questions and would prefer to begin with an advanced search rather than this basic search.	Hanan and Omar are very specific when it comes to what they want in a home, and do not want to answer these basic questions. They would like to skip this and proceed to an advanced search.
6	Makes selection “from the drop-down menu. Hits “Next” button.	Yes. They know how to select an option using a drop-down menu.	Motivation medium, still doing basic search and are on question one.	
7	The next screen asks how many bedrooms the user is looking for.	Yes, they know they are looking for 5 bedrooms.	Motivation medium due to dislike of basic search.	Adding an option on the beginning screen to skip to the advanced search could solve this problem.
8	Select a number of bedrooms and hit “Next.”	Yes, they know to select the bubble next to the “4+” option to make their selection.	Motivation low. They are still doing the basic search, and are displeased about having to make a 4+ selection rather than 5.	Would like to search for a house with exactly 5 bedrooms, so having to select 4+ was annoying to Hanan because she knows she will have to alter her selection.

9	The third question asks about the number of bathrooms the user is looking for.	Yes. They know they would like 4 bathrooms. 3 full bathrooms and one half bath.	Motivation medium, sees that they are getting closer to the end of the questions.	
10	User selects their answer by selecting the bubble next to a number of bathrooms and hits “Next.”	Yes. He knows how to select 4 bathrooms from answering the previous question.	Motivation medium.	Would like to specify half baths and full baths. This search does not allow for that.
11	The final question asks for the user’s budget by asking the user to type a minimum and maximum budget, then hit “Go” to see results.	High knowledge. They type $500,000 in the min box, and $700,000 into the max box since that is their price range and hit “Go.”	Motivation has increased because they are at the the last question according the progress bar.	Hanan and Omar disliked this basic search, would have preferred to skip to an advanced search.
12	The basic search is complete and a map with the results of the basic search appears on screen.	Low knowledge. Is not familiar with this system and is unsure what the various kinds of pins mean, and does not know how to view homes in more detail yet.	Motivation is low. They are not familiar with browsing for homes using a map view and have to overcome a learning curve before being able to use the application.	The layout of the system may be overwhelming at first. The different kinds of pins meanings is not immediately obvious, and the couple prefers a listings view.

17	Hover over bottom left corner to reveal taskbar for changing search options.	Low knowledge. Would not have known that there was a task bar there before hovering over it.	Motivation high, they want to go to the page with advanced options immediately so they can narrow the search down further.	Allow the taskbar to peek through a little in the bottom left corner so the user knows it is there. Tutorial to teach users where things are?
18	Click the option on the taskbar to go advanced search.	Yes. They know that this icon is for advanced search options.	High motivation as they want to browse for homes using advanced search options.	Users are happy there is a way to narrow down their search further.
19	Advanced options screen comes up. It has check boxes, blanks to fill in, and a field for tagging keywords they want to search.	Yes. They know exactly what they are looking for in a home and are pleased to see all the advanced search options since they know what they want for all of these.	Highly motivated to fill in the advanced search.	Hanan and Omar are very happy to be filling in this advanced search because they are so specific.
20	Use drop downs to select number of bedrooms, full bathrooms, half bathrooms, number of stories, number of garages.	Yes. Know how many bedrooms, full bathrooms, and half bathrooms they want.	Highly motivated, want to view homes that meet their search criteria.	

21	Fill in blanks for square footage, yard acreage.	Yes. Know they are looking for 2000-2500 square feet in the home, and 0.1-0.15 acres in the yard.	Highly motivated. Want to find homes with these specifications.	
22	Use the tags field to insert other items the user would like to see in the home.	Yes. They know they want a fireplace, a kitchen island, open concept, and attached garage.	Highly motivated. Want their home to have all of these things that they're specifying.	The users like the tags field because it allows them to search for more than what the drop-downs and forms allow for.
23	Click "Search" Button.	Yes	Yes	
24	Advanced search complete. A map with the results of the search appears on screen.	Low knowledge. They are not familiar with this system, and have to overcome a learning curve before being able to use it.	Low motivation. They prefer to use a listings view over the map view because they are familiar with Calgary communities and do not need the see a map to know where they are searching.	Could support both a map and a listings view for those who do not like using the map.

25	Single click on a pin that is “Green.” Shows minor details.	Low knowledge. Did not know a green pin meant the home was on the lower end of the price range, or that single click made minor details appear.	Medium motivation. Likes the minor details.	Pins that show price ranges is helpful, but is not useful for when the couple wants to do a sort and view reduced homes first. Possible solution would be to add some sort of indication on the pin that it is reduced, and to show only pins on the lower end of the price range.
26	Double click to view detailed view of the home listing.	Low knowledge. Did not know that double clicking brought up detailed listing. Thought they should be able to click once anywhere in the window and get more details.	Motivation medium. Wants to browse home and but would never think to double click.	Could make this a single click anywhere in the window to see more information, or click on the information icon. Double click did not make sense to Ian.
27	Window opens over the map and a detailed listing of the home is shown.	High knowledge. Omar and Hanan knows know what they are looking for in a home and the details on this page help them decide if they like it.	Motivation is high, viewing homes in more detail that fit their specifications.	

28	Add home to favorites.	High knowledge. Clicking the heart on the page is a typical way of adding to favorites.	High motivation, want to add to favorites because they like the house and want to see it later.	
29	Close overlay window with more details. Return to search results map.	High knowledge. Closing a window with the “x” in the corner is a usual way of closing a window	Motivation high. Is interested in resuming browsing and seeing more in the search results.	
30	Continue search by clicking on pins, seeing details, and adding to favorites if they like.	High knowledge. After being shown how to use the system, they are able to browse much more easily.	Motivation high. They are looking for a home to move into and are eager to find one they like.	
31	Views favorites by clicking the favorites button in the task bar.	High knowledge. Saw the favorites button in the task bar earlier when they were using the system.	Motivation. Want to see all the homes they liked the best.	
32	Shares favorite 3 homes with realtor using share feature.	High knowledge. Share button is common among social media apps, so the icon was familiar.	High motivation. Wants to share with realtor in order to view the homes or see ones that are similar.	

Task Example #3 - Alice and Bob

Storyboard

<insert storyboard here>

Walkthrough

Step	Step Description	Does the user have the knowledge to do this step?	Are user motivated to do this step?	Comments / solutions for this step
1	Open the app for the first time, bringing the user to the home screen.	Yes, Alice and Bob have basic computer skills and know how to launch a program.	Highly motivated. Alice and Bob both want to find a home to downsize to.	
2	User asked to type in a location. Hits “Go” button to begin search.	Yes, Alice and Bob both know where they want to live and can type it in.	Medium motivation. They might not be very fast at typing, but willing to type it in.	Maybe there could be an auto-complete feature that would speed up location entry
3	Select type of home user is looking for from drop down menu. Hits “Next” button to proceed.	Yes, Alice and Bob know how to select from a drop down menu and are clear in that they want to	High Motivation. The drop down menu makes it easy to choose what type of home they	

		live in a bungalow.	want.	
4	Select how many bedrooms they are looking for. Hit "Next" button to proceed.	Yes, they are looking for a house with at least 2 bedrooms.	High motivation.	Will selecting 2 bedrooms remove all homes that have more bedrooms but match other criteria?
5	Select how many bathrooms they are looking for. Hit "Next" button to proceed.	Yes, they are looking for a house with at least 2 bathrooms.	High motivation.	See above.
6	Enter budget range. Hit "Go" to see home that match criteria.	Yes. Alice and Bob know their budget and can type it in easily.	Medium motivation. Can type it in, but would prefer drop down.	Drop down might be too large since there are many price points people look at.
7	Map displays homes that match their basic search criteria. User can select pins to see more information in a pop up, double clicking shows home profile page.	Lacking knowledge. Alice and Bob may not know that hey can click on pins to see information.	High Motivation.	Alice and Bob may be able to figure out how to see pop up by experimenting, but may not be clear on how to

		They may not know they can see more information than the pop up.		see more information. Does system show nearby amenities on map?
8	See house profile page and add favourites.	Yes, Home profile page has favourites icon that clearly identifies “add to favourites”	High Motivation. Alice and Bob can easily see all the information about house they are looking at, and can easily add it to favourites.	
9	Hover over lower left corner to see bar and view all their favourites.	Lacking knowledge. Alice and Bob may not know that the bar is there at all.	High Motivation. They want to see all the properties they have added to their favourites.	Make the bar persistent but collapsable to clearly show the user it is there.
10	Add some favourites to a compare feature to see multiple properties side by side.	Lacking knowledge. They may not know that the symbol for	High motivation. They want to compare properties side	Make it so that when users hover over a certain button it will show in

		compare means compare	by side to decide on specific properties to send to their realtor	plain text what that button does.
11	Send Favourites to their realtor.	Yes, in home profile page they can send this property to their realtor.	Low motivation. They have to go through each of their favourites to send them to their realtor instead of sending the entire list at once.	Add functionality to be able to send all the properties in their favourites to their realtor at once.

Task Example #4 - Dominique Birth

Storyboard

<insert storyboard here>

Walkthrough

Step	Step Description	Does the user have the knowledge to do this step?	Are user motivated to do this step?	Comments / solutions for this step
1	Open the app for the first time,	Yes. She is proficient with	High motivation. Doe wants to	

	which brings the user to the home screen.	computers and knows how to open an application.	browse home listings and is motivated to use the application.	
2	Types a location into the Search Bar and presses enter key	Yes	Yes	
3	Selects “Home” from drop down menu and clicks “Next”	Yes	Yes	
4	Selects “3” for # of Bedrooms and clicks “Next”	Yes	Yes	Doe wished to enter “2-4” but was unable. Radio selection might be too simple. Perhaps a range would be better?
5	Selects “3” for # of Bathrooms and clicks “Next”	Yes	Yes	Doe wished to enter “2-4” but was unable. Radio selection might be too simple. Perhaps a range would be better?
6	Enters her budget range and clicks “Go”	Yes	Yes	

7	Locates Advanced Search Parameters in the Taskbar and clicks the “Cog” icon.	Medium. Taskbar is not immediately obvious. Doe sees it appear once she moves her mouse.	High. Process has been smooth thus far.	
8	Advanced search view appears. Selects “Garage” tickbox	High. Garage option is visible and tick-boxes are simple.	High. No major roadblocks encountered.	
9	Enters the following hashtags in the “Tags” field: “#openconcept, #bright, #largebackyard” and clicks “Go”	Medium. It feels like somewhat of a guessing game specifying hashtags that may or may not match any results.	High. Doe is an experienced social media user and feels confident writing tags for the criteria without specific filters.	
10	Zones in on results in NW Calgary with mouse scroll wheel	High. Doe has used Google Maps many times before.	High. Excitement mounts once final results appear.	
11	Single-clicks a property pin to open info pop-up	High. While new to the interface, a single-click is the obvious first step.	High. As above.	

12	Favourites the property by clicking heart icon	Medium. The photo looks great and the house is within her budget. She assumes “heart” means “like”, or “favourite”, so she clicks the icon.	Yes	
16	Single-clicks the same pin again to make pop-up disappear, as it is blocking another pin.	Medium. She knows another pin is hiding underneath, so she tries what seems plausible, given that no ‘X’ button exists.	Yes	Perhaps info pop-ups should have ‘X’s for this reason.
17	Single-clicks the pin that was hidden underneath, then favourites that property as well.	High. Doe is now familiar with the process. This property is in the same neighbourhood and looks nice too.	Yes	
18	Clicks on the “Favourites” heart icon in the taskbar.	Medium. The icon is consistent, so Doe expects it to bring her to a “Favourites” screen	Yes. Happy with these properties, Doe wants to share them right away.	

19	Clicks “Send to Realtor” ….			

Step	Step Description	Does the user have the knowledge to do this step?	Are users motivated to do this step?	Comments / solutions for this step
1	Michelle opens the browser app for the first time, which opens the home screen.	Yes, Michelle is competent with computers.	High motivation. Michelle wants to open and use the app.	If the app has to load, add a loading screen or progress bar.
2	Enters a location into the search bar.	Probably. It is unclear whether the app wants your current location or the location of a desired home.	Medium motivation. There is a loss in motivation from the search bar confusion.	Right now, the home screen is empty, so add a logo. Add clarification to the search.
3	Selects “Home” as the type of property being searched for.	Yes, the dropdown list and question are self-explanatory.	Possible loss in motivation after seeing the number of questions.	Add two questions to the same screen to cut down on the number of screens.
4	Selects “2” for the number of bedrooms.	Yes. However, she wanted to select “2 or more” as her option.	Same motivation.	Put bedrooms and bathrooms question on the same screen. Add a range option.

5	Selects “1” for the number of bathrooms.	Yes, but she wanted to select “1 or more” as her option.	Same motivation.	Same suggestions as the last step.
6	Enters the budget range and finishes the basic search questions.	Yes, she knows her budget and how to input the information.	Same motivation.	We need to prevent users from entering nonsense (e.g. negative numbers).
7	Starts looking through the “pins” on the map view.	Medium knowledge. Knows how to use Google Maps, but this map has different buttons/controls.	Higher motivation because there are now visually interesting results.	
8	Zooms in on the map because the pins are clustered together and difficult to tell apart.	High knowledge, if the zoom button is similar to Google Maps or other maps.	High motivation, wants to see individual houses instead of a cluster.	Zoom button needs to be obvious.
9	Clicks on a random pin to get started. The home’s mini-profile pops up.	Knows how to select a home, but not how to display the full profile.	Same motivation.	The single-click VS double-click functionalities aren’t immediately obvious.
10	Accesses the full profile.	Low knowledge. Other apps don’t often differentiate	Same motivation.	Prompt the user to double click if this is their first time

		between single clicks and double clicks.		using the app, like a tutorial. Or change how profiles are accessed.
11	Decides the home looks promising and adds the property to "favorites".	High knowledge. Hearts are commonly used to denote favorites on online communities.	High motivation because this feature is very familiar.	
12	Closes the app.	High knowledge. Closing a program is standardized on a desktop.		

Walkthrough Analysis

After completing our prototype walkthroughs, we were able to identify our system's main problems. The first problem was that some users want the option to skip the basic search and go directly to the advanced search. This could be fixed by adding a button to the first page that brings up the advanced search. Another problem with the basic search was that users cannot select a range for the number of bedrooms and bathrooms. We could accommodate this by changing our selection bubbles to check boxes. With respect to the map view, users did not think of doubleclicking the pins to see the detailed home profiles. Instead, their intuition was to click anywhere on the small popup to see the full profile. Adding an information icon would be a more obvious way of opening the large window. Not all users liked the map view, either, as a list view makes it easier to sort listings by price.

The walkthroughs taught us that while many of our features are well-designed, there is also room for improvement. We will change our basic search screens by adding a range of options and a "skip" button. We will also make changes to the map's interface and, if time allows, add a supplementary list view.

Compiled Heuristic Evaluations

Issue	Classification	Severity
Can’t bypass the basic search or skip to the advanced search	Flexibility and efficiency of use	3
Dropdown menus shift selection depending on what was selected. If the user makes a mistake and tries to re-select the correct option, the option’s position shifts from where it was	Error prevention	2
Can’t select range of bedrooms or bathrooms in basic search	Flexibility and efficiency of use	1
When clicking on toolbar icons, some of them have a similar interface (bedrooms and bathrooms). It doesn't say which one is selected while changing their values	Visibility of system status	2
Not clear that the Favourite and Compare buttons are actually buttons since they are very similar to the other icons on the profile page	Consistency and standards	2
Not clear that clicking the Compare and Favourite buttons actually adds the home profile to those screens	Visibility of system status	3
User might click to see next image when trying to exit house profile	Error prevention	2
Can’t go back to search when the Home icon is clicked by accident	Error prevention	2
On Favourites screen, users don’t have the ability to quickly remove a listing from their favourites. They have to go into that listing’s profile and remove it there.	Flexibility and efficiency of use	2
Not obvious that the Compare icon means “Compare”	Aesthetic and minimalist design	1
No error-checking for range when selecting larger number to smaller number	Error prevention	2
Mouse-over icons in bottom-right taskbar don’t display what the button is for (e.g. mouse over House Icon should read “Property	Consistency and standards	1

Type"). This functionality is available for the home profile icons, though.		
Taskbar does not remember results from basic search or advanced search. Advanced settings don't remember user input from the basic search.	Recognition rather than recall	3
Image of realtor on the home details page makes it look like a profile page	Aesthetics and minimalist design	1
The color-changing icons in Favorites are not clickable, but they appear to be buttons	Match between system and real world	2
Home profiles with only one picture still display arrows that make the user believe there are more photos in the gallery	Consistency and standards	2
Minimizing the application's width causes the icons to overlap and get cluttered	Aesthetic and minimalist design	2

Heuristic Evaluation Results

After completing individual heuristic evaluations, our team identified the following problems and possible solutions:

- *Severe Problems:* Users cannot skip the basic search or access the advanced search from the intro screen, which may frustrate experienced users. From the perspective of novice users, it may not be clear that a home profile was added to the Favorite or Compare functions, even though the selected button changes colors. It is also a major problem that the advanced search and taskbar settings do not remember user input from the basic search, which could be fixed by storing search parameters in the app's files and retrieving them as necessary.
- *Moderate Problems:* Users may accidentally click on the map's Home icon, bringing them to the intro screen. They also do not have a quick way of removing homes from their Favorites when there should be a "remove" or "X" button on the list view itself. Another problem is that the dropdown menu selections change position based on what was selected - instead, they

should maintain a consistent position. Users may also be confused by the fact that profiles incorrectly display arrows (as if there are multiple pictures) when the profile only has one picture in its gallery. There is also an issue with the app's layout when the window changes size - at narrower widths, buttons get cluttered and start to overlap. Finally, the map toolbar does not indicate which icon is selected when the number of bedrooms or bathrooms is changed.

- *Minor Problems:* Users cannot select a range of bedrooms or bathrooms to search for, which limits their search parameters. It may also be unclear what certain icons (e.g. Compare) on the taskbar mean. Another problem is with the home details page - the inclusion of a realtor photo makes the popups look like the realtor's profile page. This could be fixed by clearly labelling the photo as the realtor, de-emphasizing the photo, or removing the photo entirely. Lastly, there is an error on the Favorites page, when certain icons (bedrooms, bathrooms) are moused over and change color. This color change makes the icons appear to be clickable when they aren't.

Final Design Critique

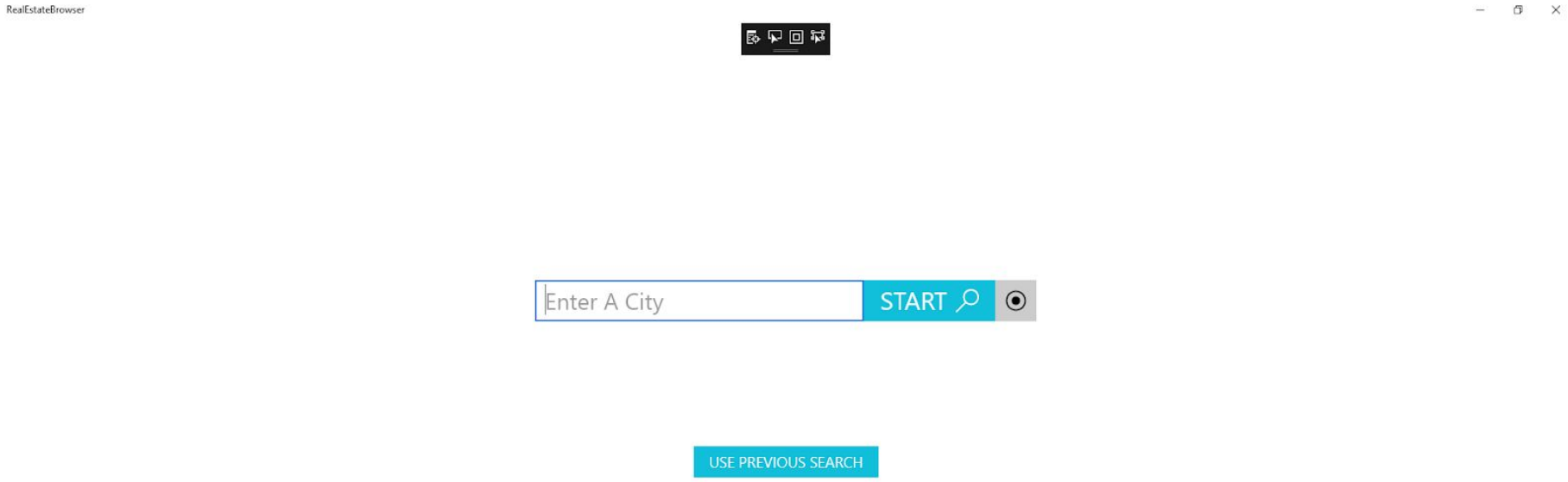
Although there is room for improvement in our design, we feel as though many things were done well, especially when evaluating the interface based on Jakob Nielsen's *Ten Usability Heuristics*. *BrowseEstate* keeps users informed about the system's status through appropriate feedback, such as the progress bar while answering the basic search questions and the loading circle after the user has selected a city that indicates the system is working and not lagging. The system also provides sufficient error prevention, by presenting error messages explaining the problem that occured using bold red text as well as small popups. The error messages are concise and do not overwhelm the user with large, complicated system messages and language the user may not understand. Users also do not have to remember their previous search parameters, as the system stores and remembers previous cities, as well as search tags, so that the user does not have to constantly recall information each time they browse new properties or modify their search. Icons like the location pin on the start screen, magnifying glass for search, and the bed, bath and heart icons are familiar to users, and using these well-known symbols ensures that users already know the functionality and meanings behind them, which gives the system a much smaller learning curve. *BrowseEstate* is also aesthetically pleasing with its minimalist design. The screens are not cluttered with pictures or text, icons are used to keep

the interface simple, and the main map does not have anything but the essentials for browsing homes. This includes the taskbar of icons and the home button for returning to the start screen. Lastly, the integration of the *BingMaps* API creates a familiar visual environment for browsing based on location, which we found was extremely important to users who are searching for properties.

There are also many aspects of our project that could be changed or improved upon. These include problems with our app's visuals, as certain icons may change color when hovered over, even though they do nothing when clicked. And while we have used many familiar icons, our program should have better documentation, as there are custom icons that users will be unfamiliar with. For example, each icon could display a label describing what the button does (e.g. "Compare", "Additional Information") when it is hovered over. Another possibility is to include a "Help" section with a glossary. Some error recognition is also missing, as unexpected user input (e.g. for the ranges) should be automatically compensated for (a larger number is entered first versus a smaller number entered first, but the system understands both inputs). Lastly, there is a lack of feedback when certain actions are performed. When a home profile is added to the user's Favourites, the Favourites icon changes color, but it may be beneficial for users to also see a small "Added" message pop up briefly. This could be applied to the Compare icon as well. Feedback should also be added to actions where there currently is none - such as removing a home profile from the list of Favorites. Users should be asked for confirmation before the deletion takes place and if they don't want to see this message for every deletion, the option should be given to no longer show the popup.

Overall, our design is functional and some of the proposed changes have even been implemented since our heuristic evaluations, like the addition of a "use previous search" button to the main page. Our group's consensus on the current state of our project is that the remaining problems are relatively minor, with most of those problems being easily fixed by adding buttons, labels, and error-checking.

Final Interface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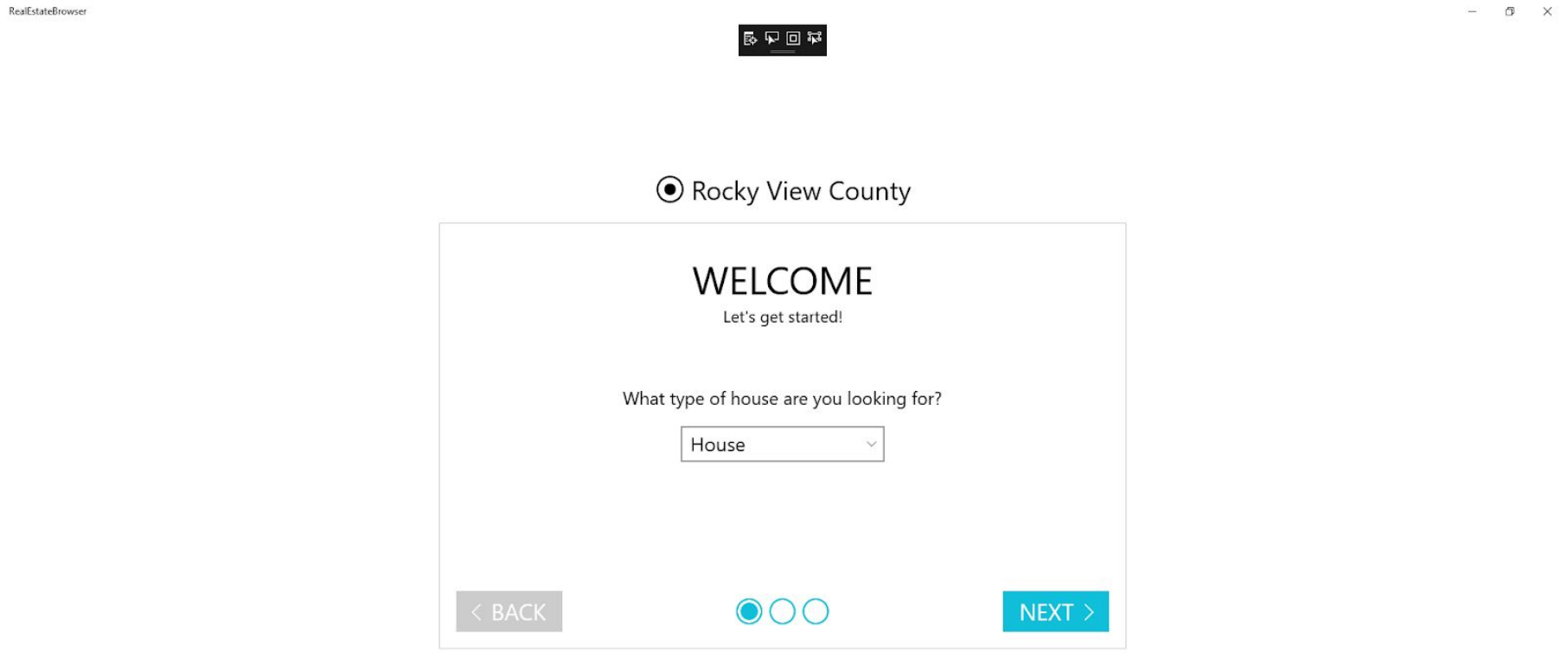
Enter A City
START
USE PREVIOUS SEARCH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Rocky View County
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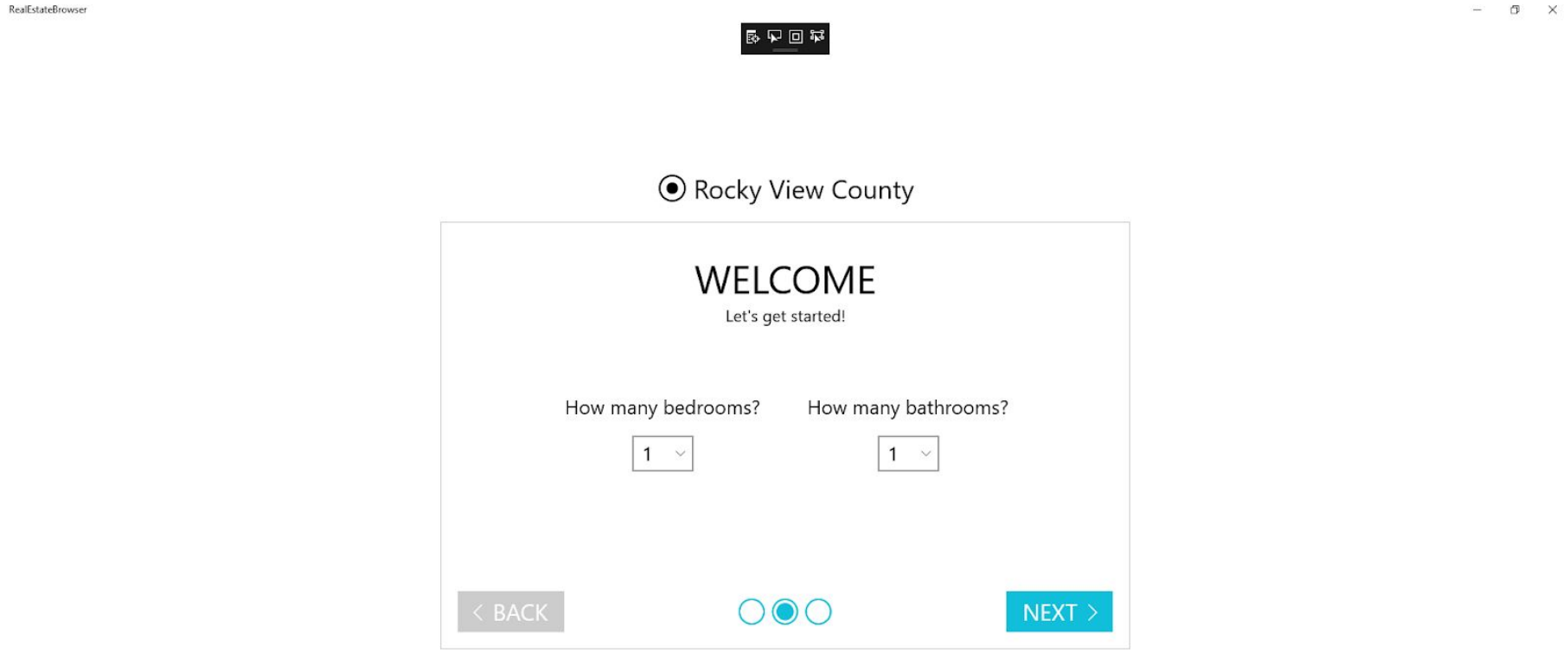
Let's get started!
What type of house are you looking for?
House
BACK
NEXT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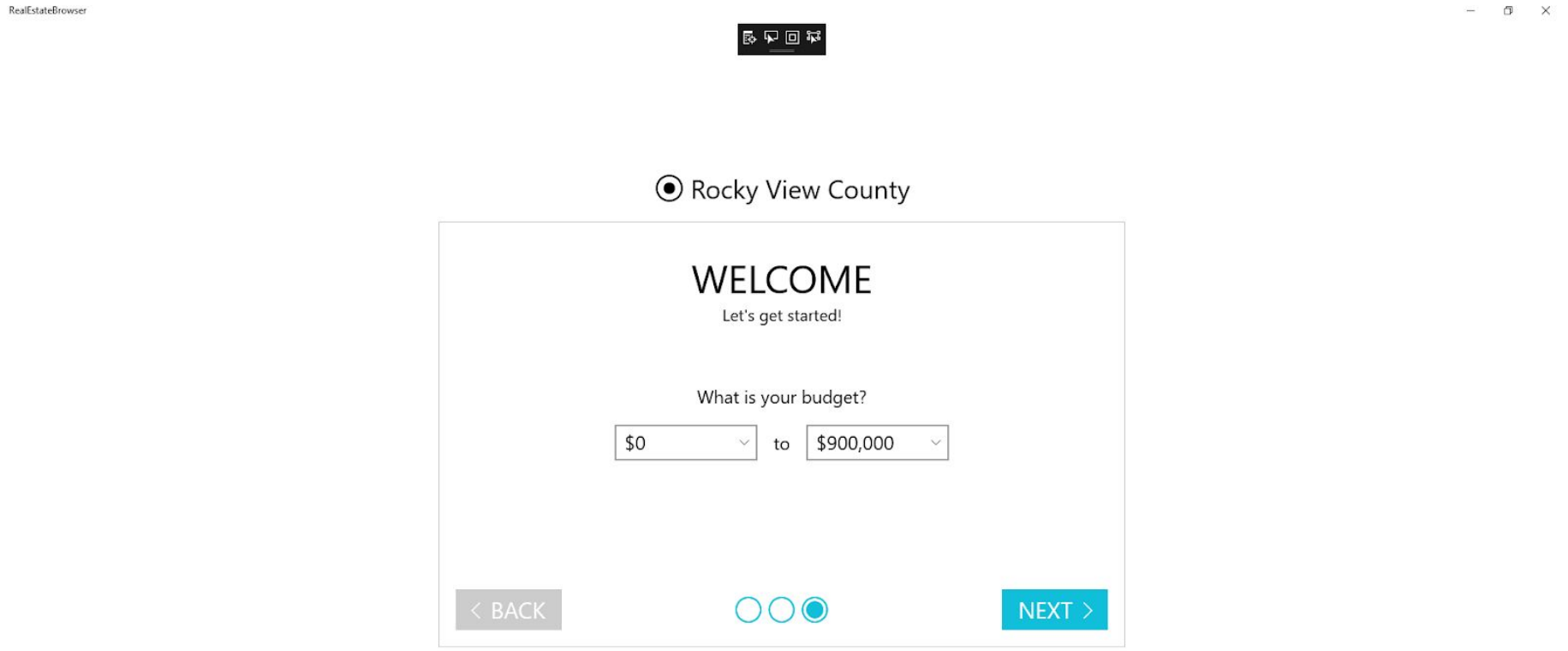
How many bathrooms?
1
BACK
NEXT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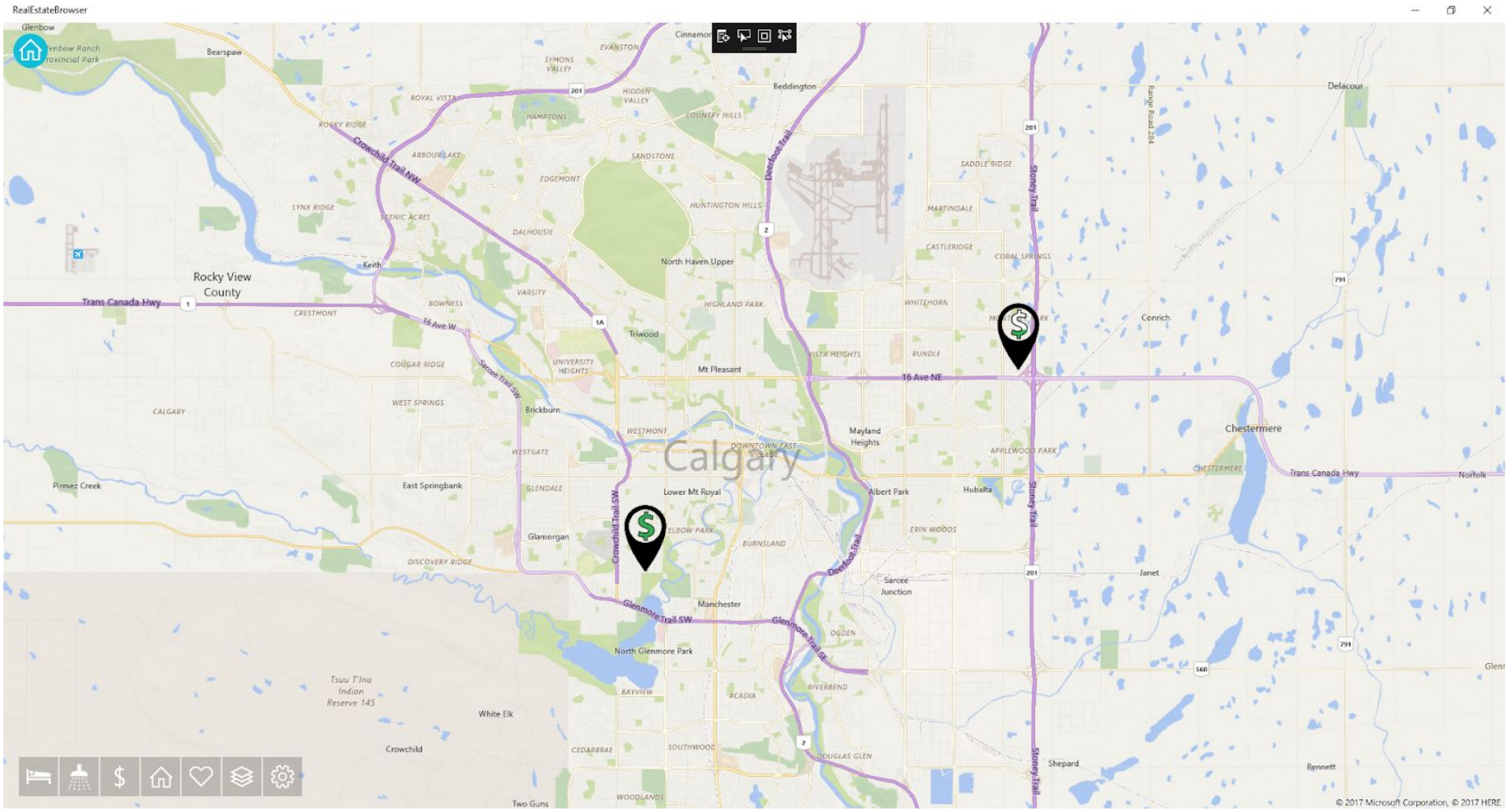
Rocky View County
WELCOME
Let's get started!
What is your budget?
$0
to
$900,000
BACK
NEXT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Triwood
Mt Pleasant
16 Ave NE
Conrich
Deerfoot Trail
Stoney Trail
Calgary
Brickburn
Mayland Heights
Chestermere
Trans Canada Hwy
Norfolk
Pirmez Creek
East Springbank
Lower Mt Royal
Albert Park
Hubalta
Glamorgan
Crowchild Trail SW
Sarcee Junction
Janet
Manchester
Glenmore Trail SW
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Tsuu T'ina Indian Reserve 145
White Elk
Crowchild
Shepard
Bennett
Two Guns
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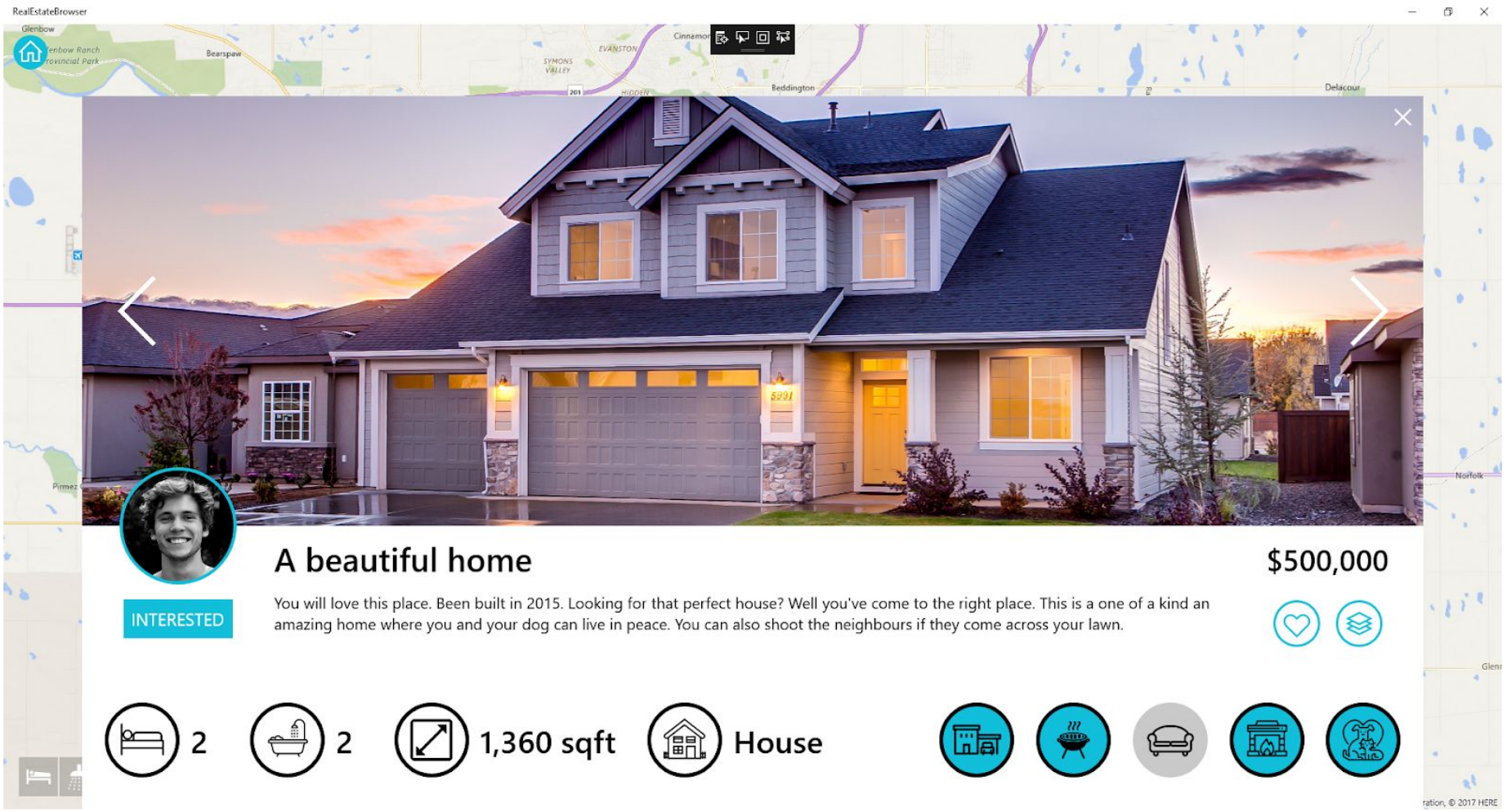
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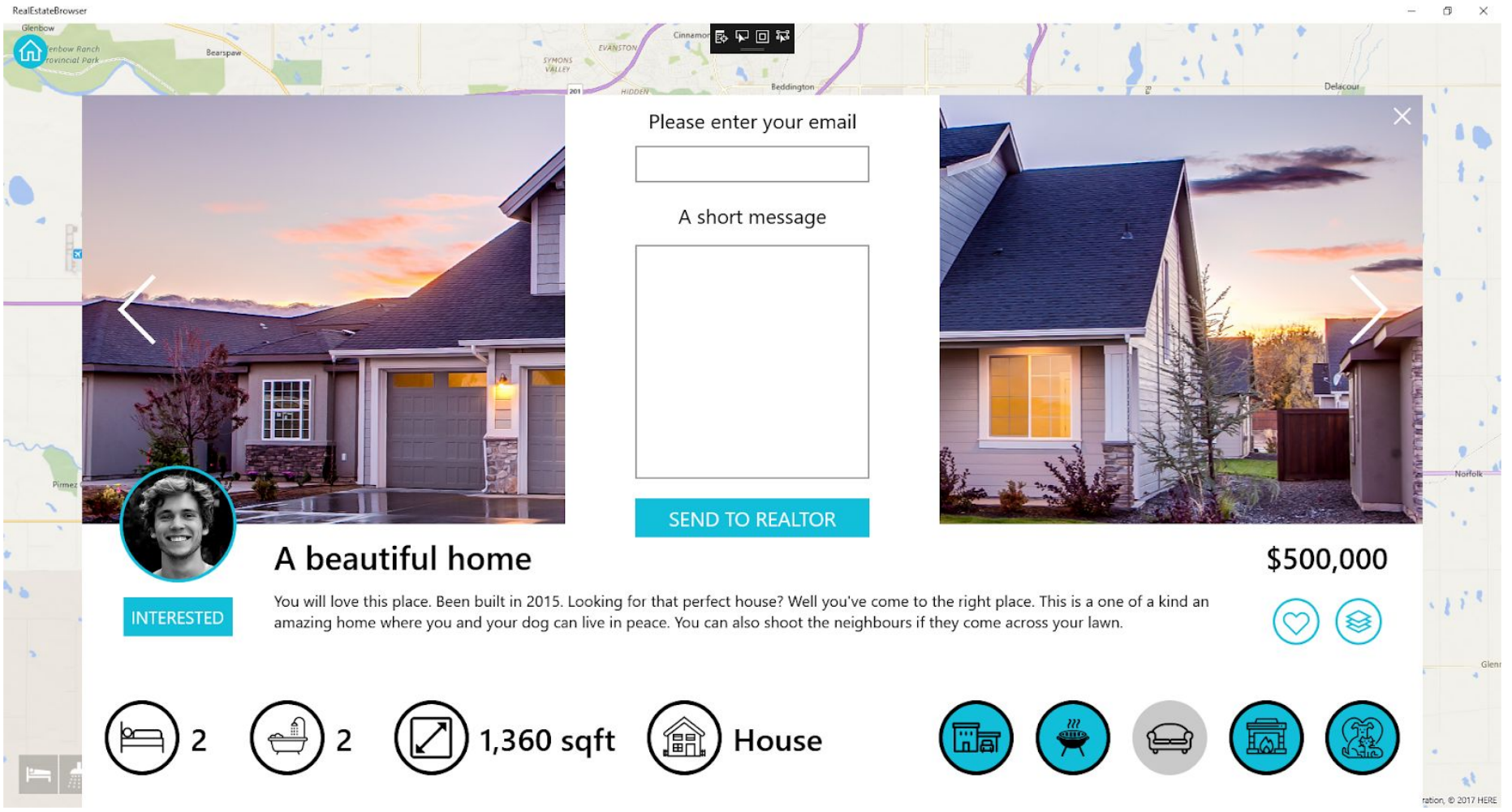
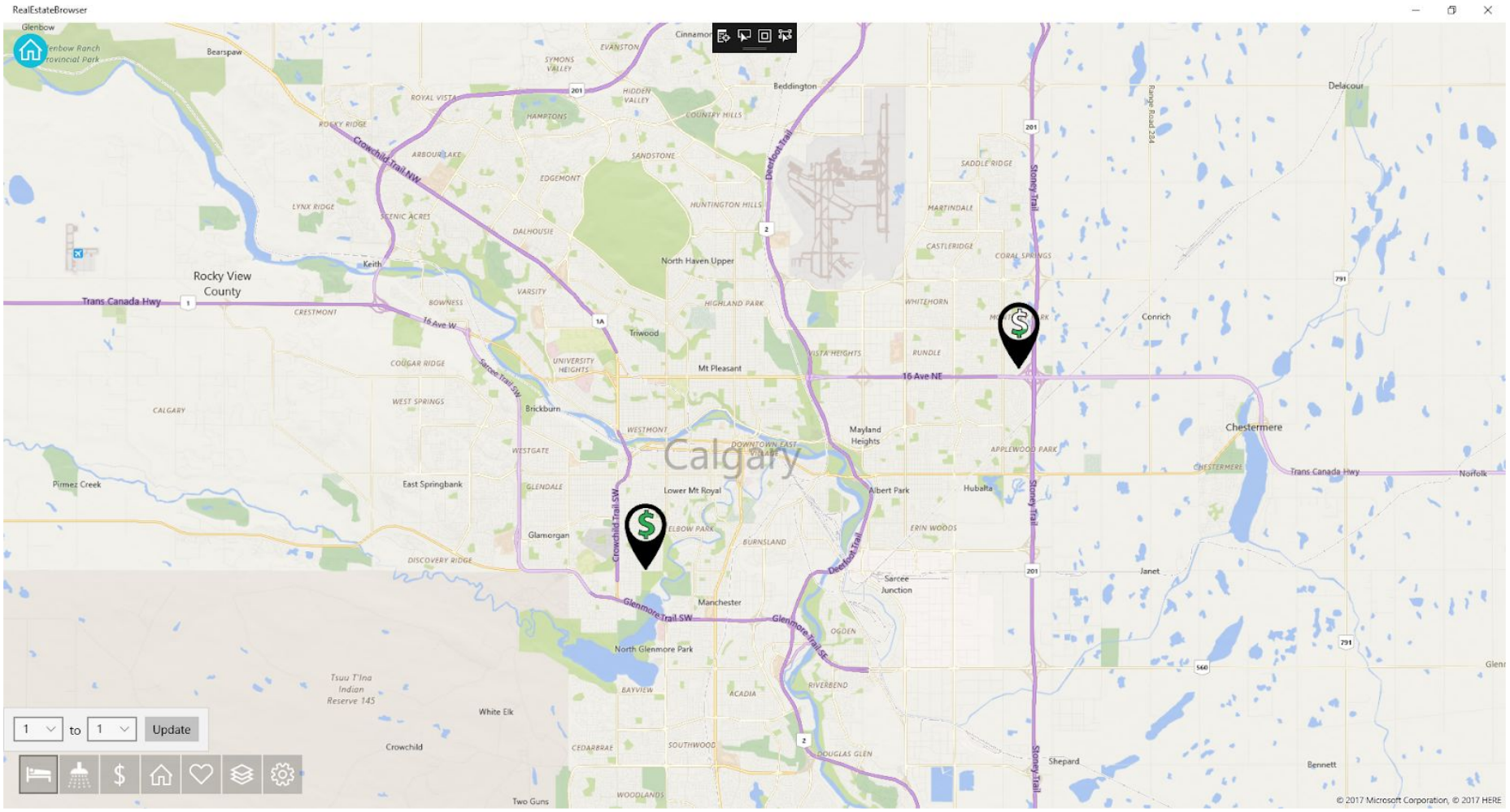
Glenbow
Bearspaw
Cinnamon
Beddington
Delacour
Norfolk
A beautiful home
$500,000
INTERESTED
You will love this place. Been built in 2015. Looking for that perfect house? Well you've come to the right place. This is a one of a kind an amazing home where you and your dog can live in peace. You can also shoot the neighbours if they come across your lawn.
2
2
1,360 sqft
House


RealEstateBrowser
Please enter your email
A short message
SEND TO REALTOR
A beautiful home
$500,000
INTERESTED
You will love this place. Been built in 2015. Looking for that perfect house? Well you've come to the right place. This is a one of a kind an amazing home where you and your dog can live in peace. You can also shoot the neighbours if they come across your lawn.
2
2
1,360 sqft
House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Trans Canada Hwy
Keith
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Stoney Trail
Range Road 224
Conrich
Trinwood
Mt Pleasant
16 Ave NE
16 Ave W
Calgary
Brickburn
Mayland Heights
Chestermere
Trans Canada Hwy
Norfolk
Pirmez Creek
East Springbank
Lower Mt Royal
Albert Park
Hubalta
Glamorgan
Crowchild Trail SW
Sarcee Junction
Janet
Manchester
Glenmore Trail SW
North Glenmore Park
Tsuu T'Ina Indian Reserve 145
White Elk
Crowchild
Shepard
Bennett
Two Guns
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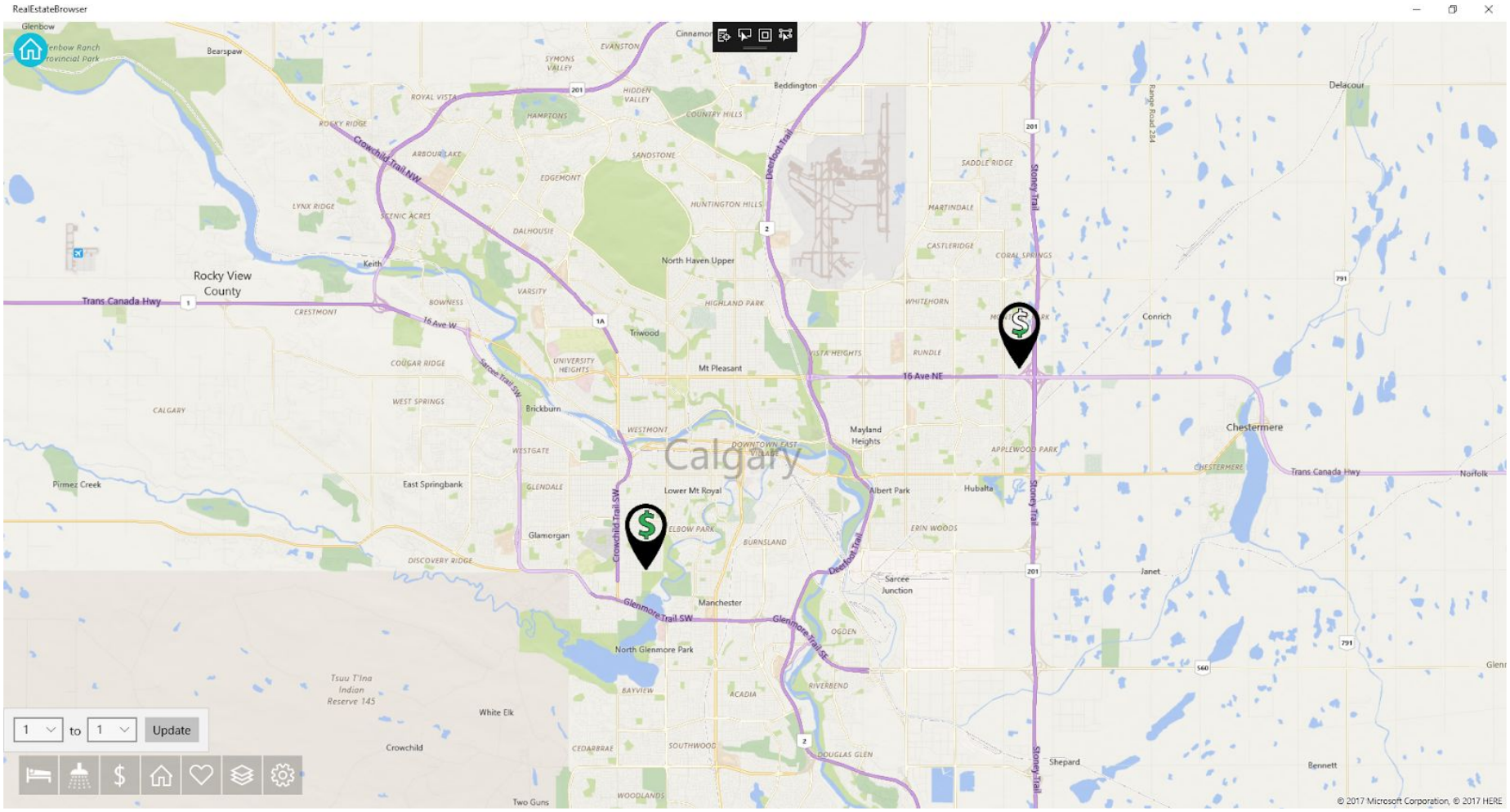
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Range Road 224
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Triwood
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16 Ave NE
16 Ave W
Sarcee Trail SW
Brickburn
Calgary
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Chestermere
Trans Canada Hwy
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Pirmez Creek
East Springbank
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Sarcee Junction
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Manchester
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North Glenmore Park
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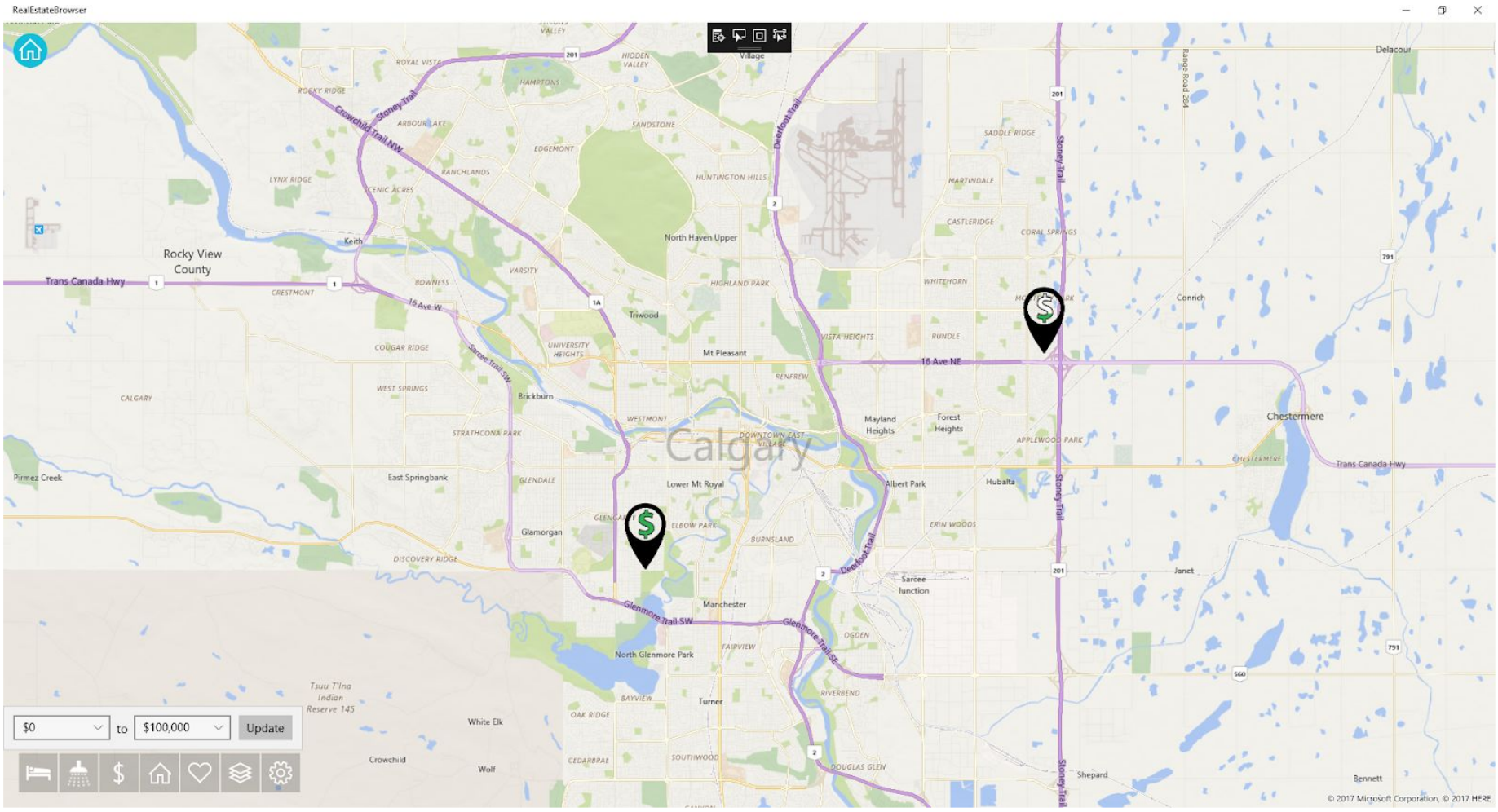
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Turner
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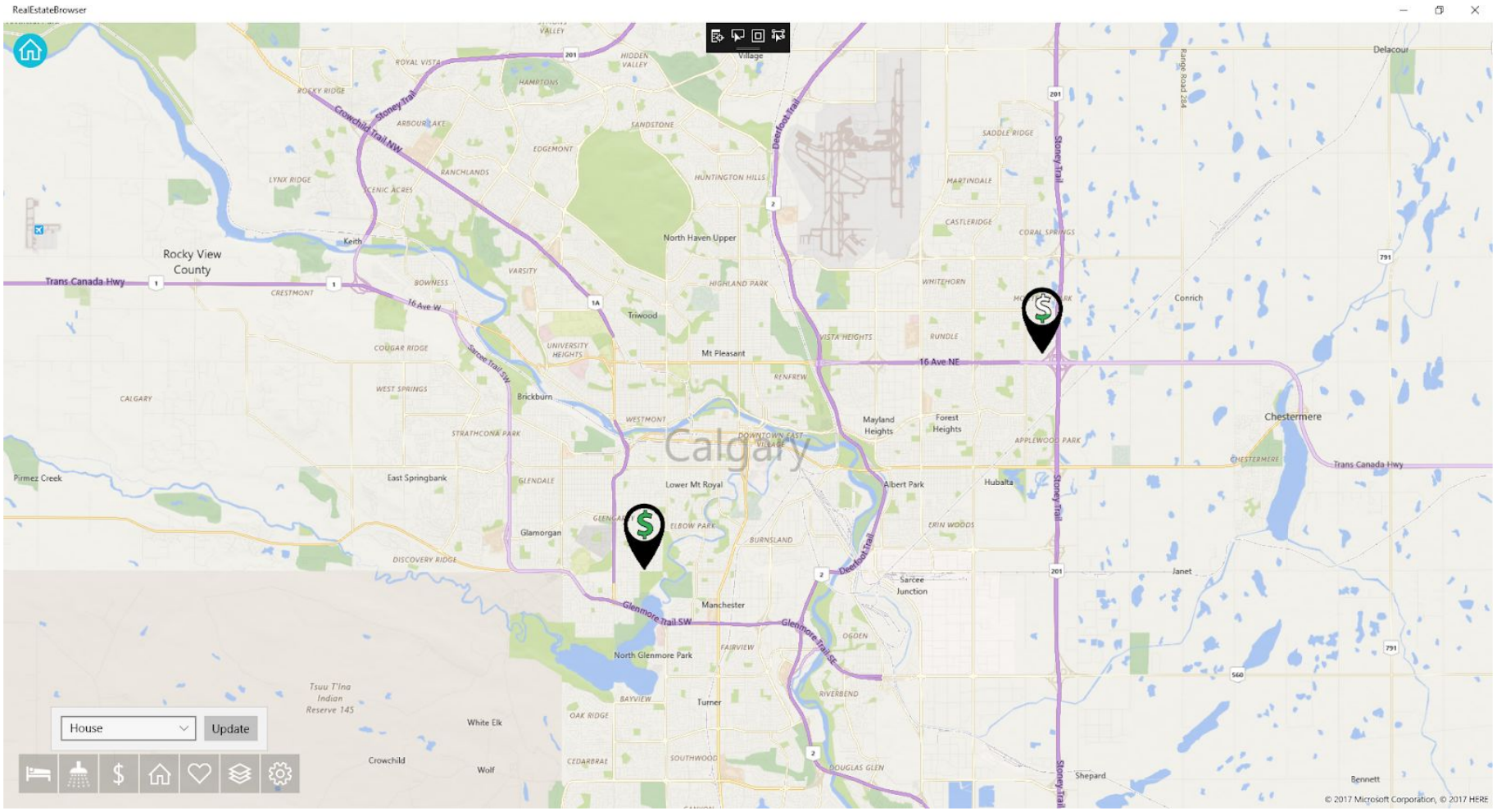
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Deerfoot Trail
Glenmore Trail SW
Glenmore Trail SE
Manchester
Lower Mt Royal
Glamorgan
East Springbank
Pirmez Creek
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Forest Heights
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Hubalta
Chestermere
Conrich
Delacour
Janet
Sarcee Junction
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Wolf
White Elk
Tsuu T'ina Indian Reserve 145
House
Update
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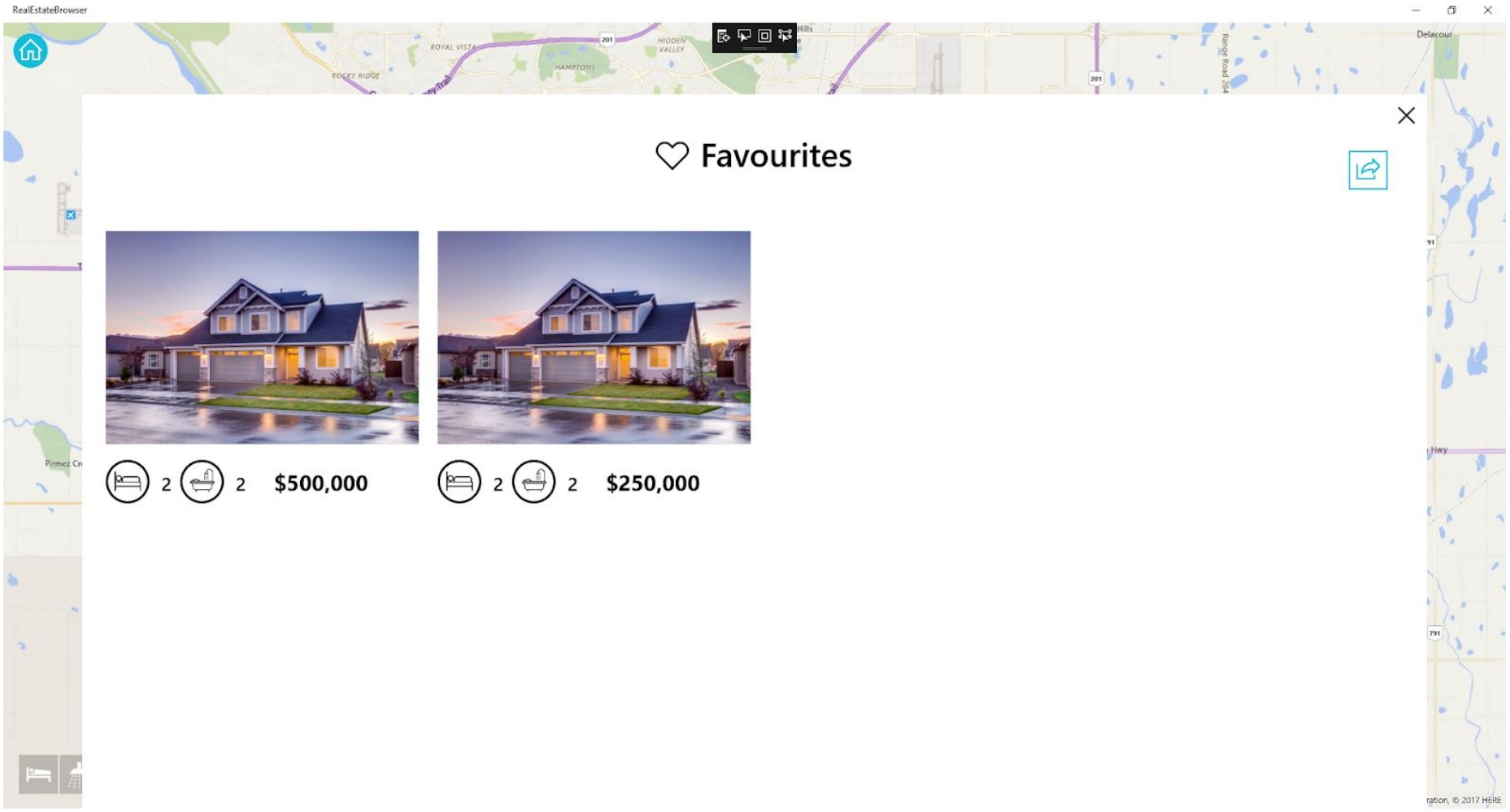
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HAMPTONS
HIDDEN VALLEY
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2
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Hwy
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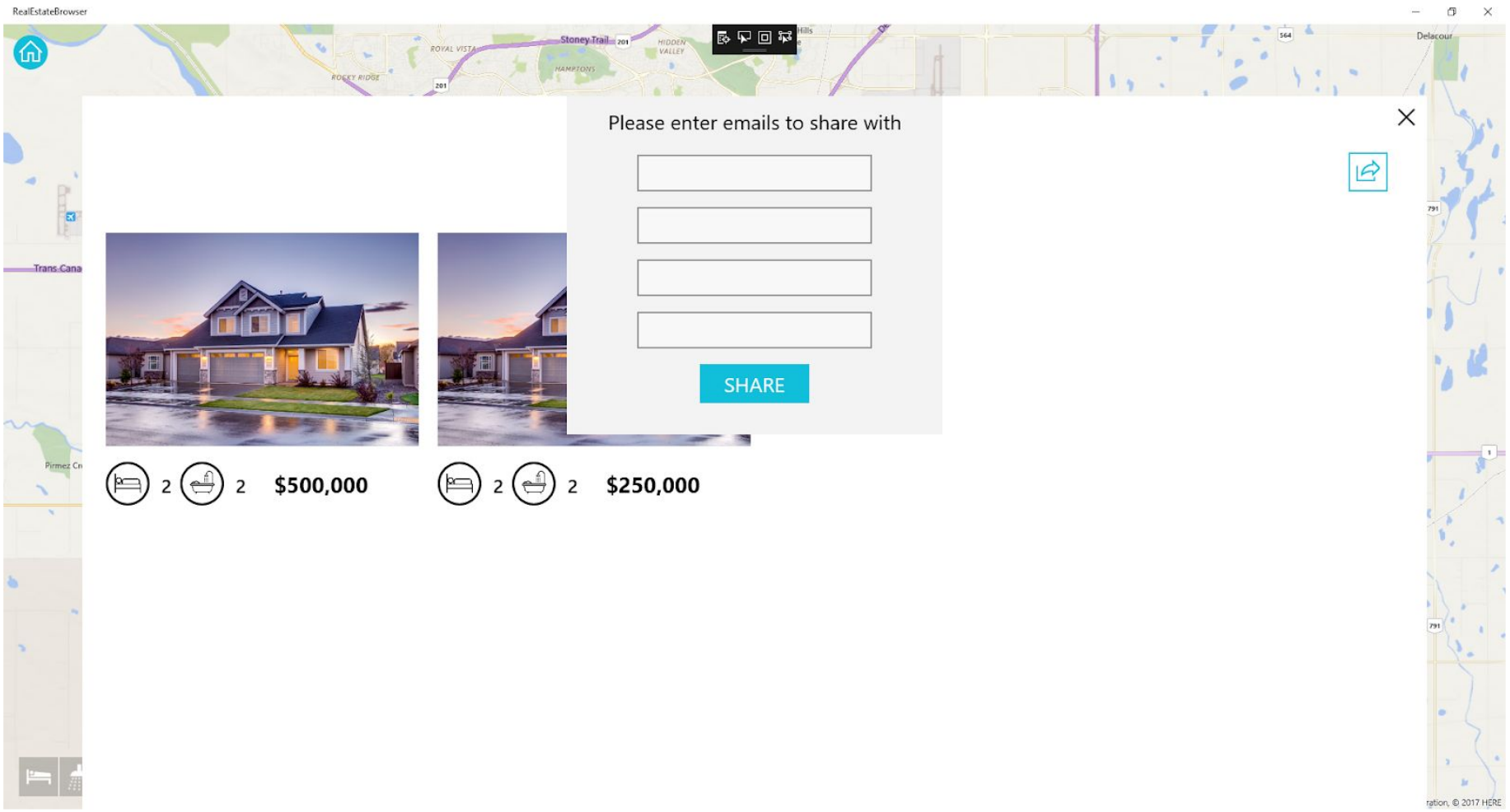
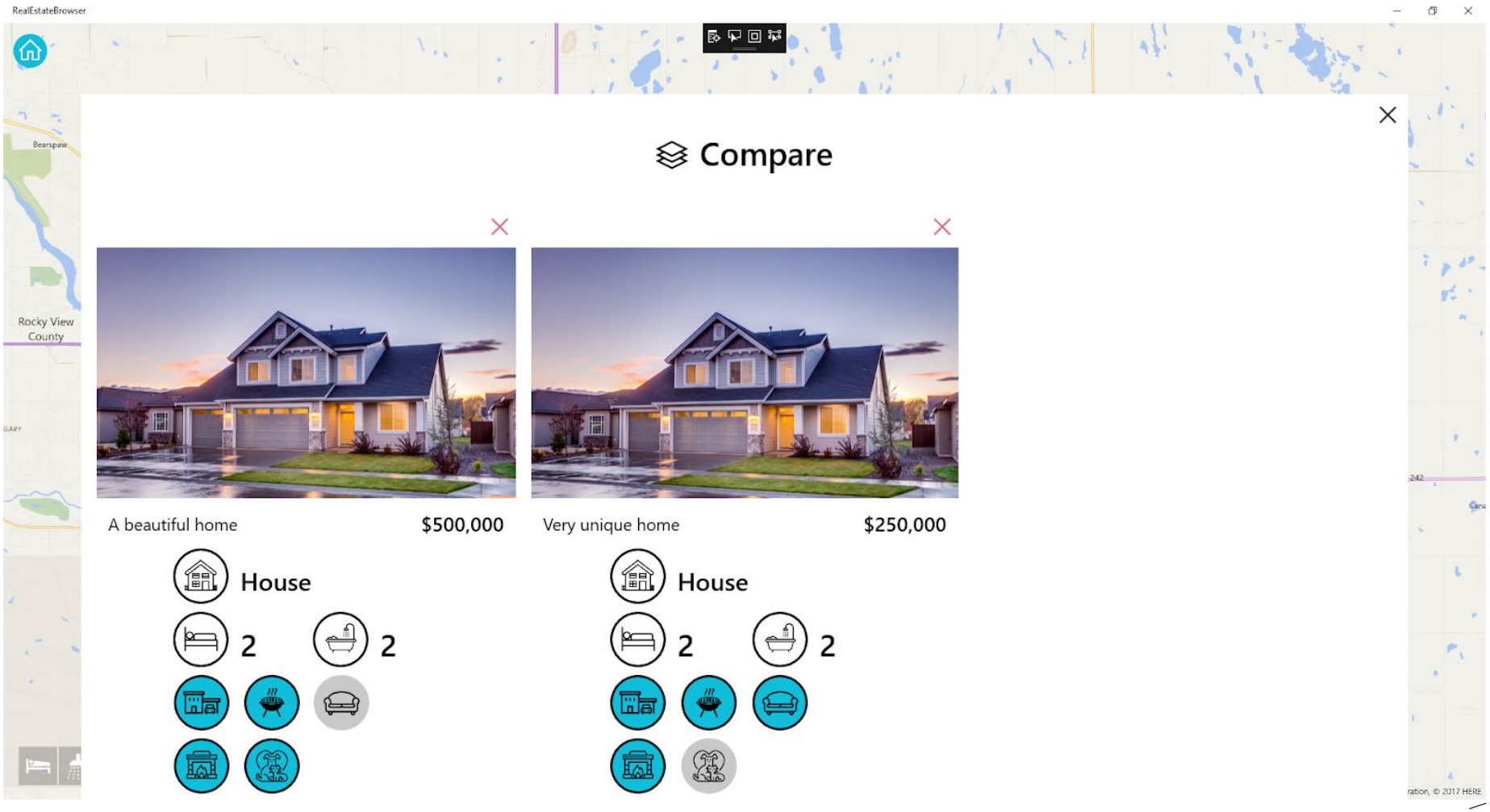
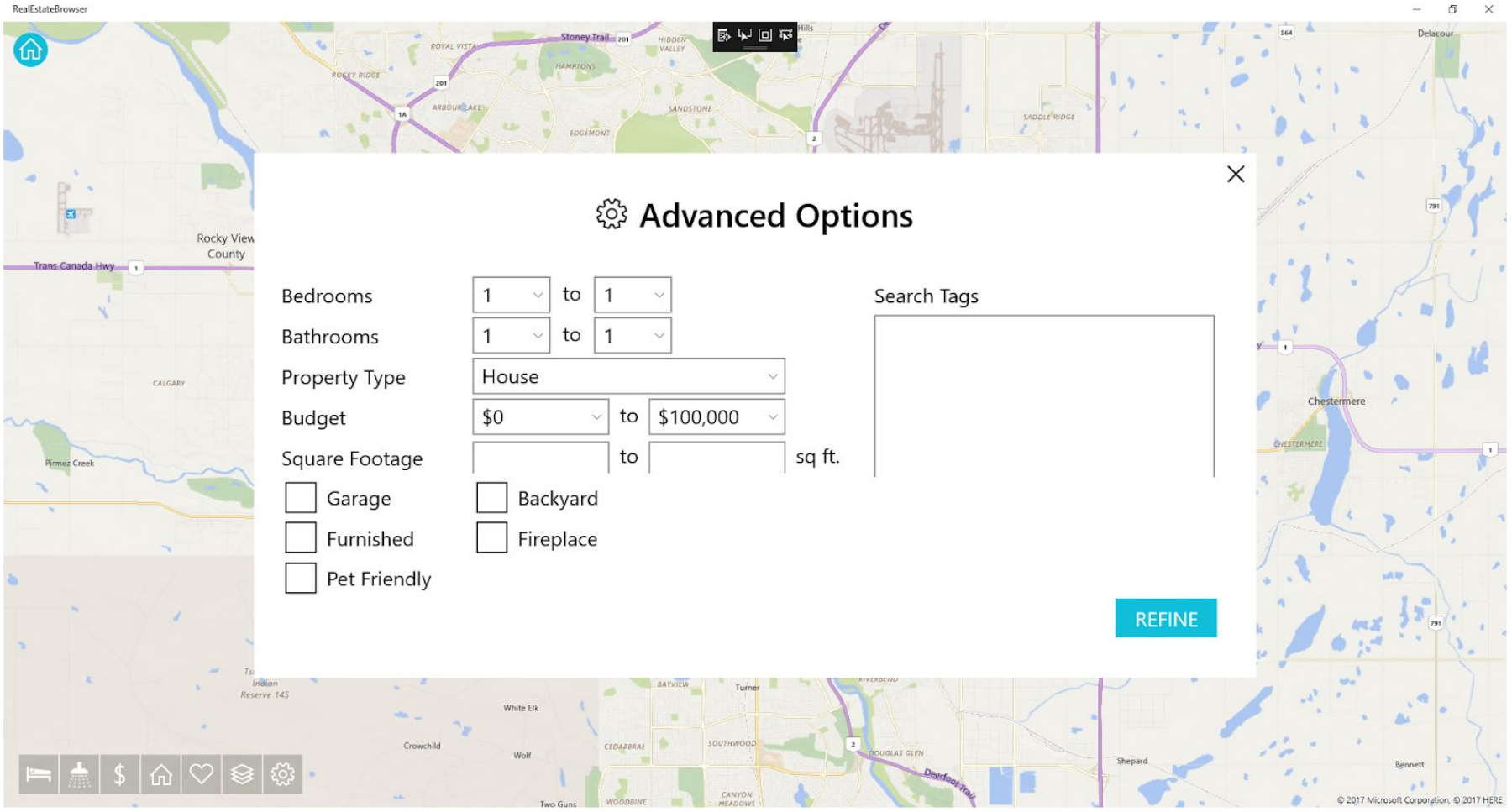

RealEstateBrowser
Please enter emails to share with
SHARE
2 2 $500,000
2 2 $250,000


RealEstateBrowser
Compare
Rocky View County
A beautiful home
$500,000
House
2
2
Very unique home
$250,000
House
2
2


RealEstateBrowser
Advanced Options
Bedrooms
1
to
1
Bathrooms
1
to
1
Property Type
House
Budget
$0
to
$100,000
Square Footage
to
sq ft.
Search Tags
Garage
Backyard
Furnished
Fireplace
Pet Friendly
REFINE
Stoney Trail
Rocky View County
Trans Canada Hwy
CALGARY
Pirmez Creek
Chestermere
Delacour
Indian Reserve 145
White Elk
Crowchild
Wolf
Two Guns
Turner
Shepard
Bennett
Deerfoot Trail
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Appendix I: Rejected Prototypes

Appendix II: Medium Fidelity Prototype, Walkthrough and Redesign Rationale