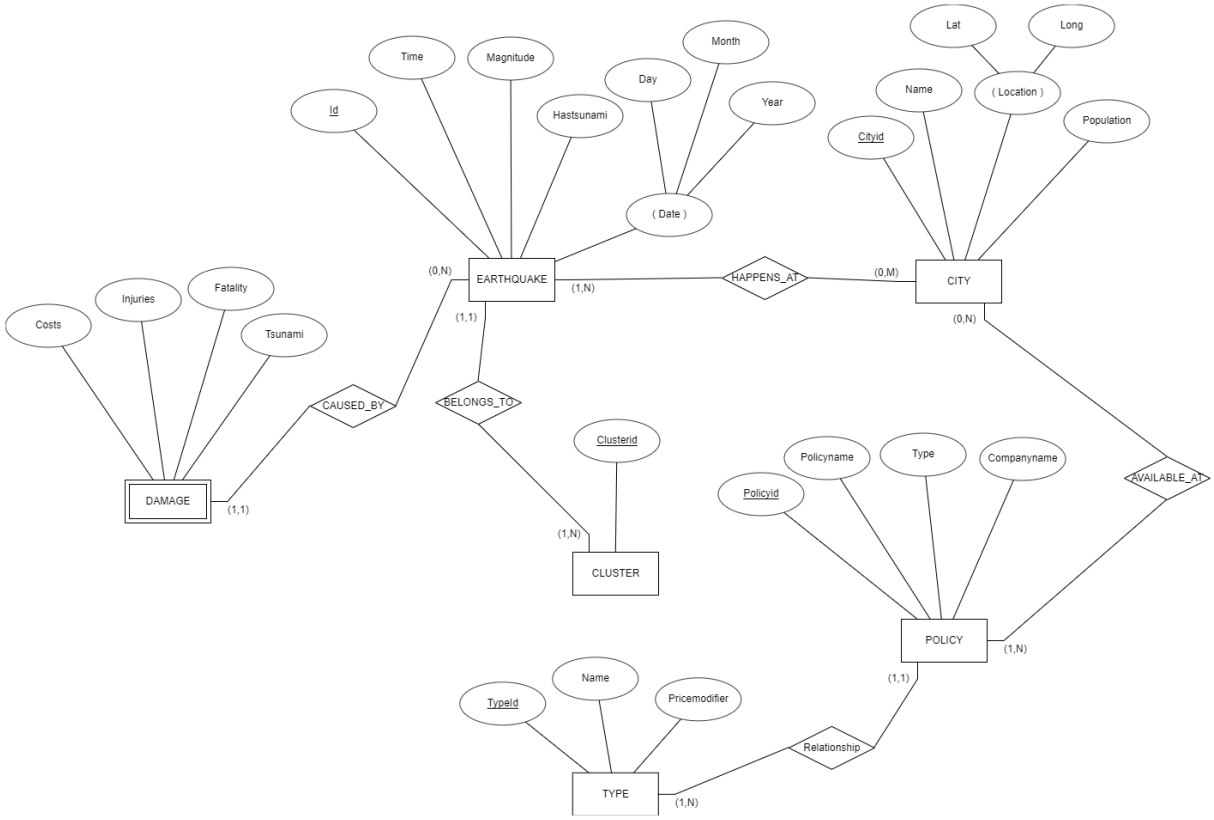
Milestone 2:

For milestone 2, our team has focused on structure and design; i.e., defining the ways that the database will be built and maintained before the actual implementation. Most of this document ought to be readable for a non-technical person through the use of diagrams, figures, and common, generalized speech. By doing so, if we discover we can't explain our concepts to a non-technical person, it is obvious we have worked our way into a compromising circumstance that must be resolved before the implementation process.

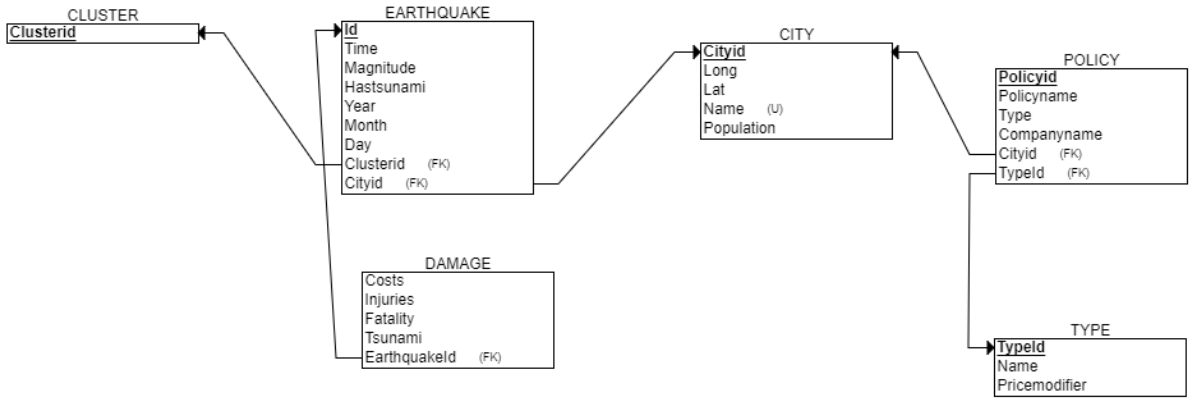
ER Diagram:



This ER diagram is subject to change. We are considering possibly changing the "City" entity to "Region" in the event that we run into difficulties clearly defining in what city an earthquake

took place. We are also considering adding a few more attributes to the policy and maybe even making a seperate weak entity for the “Type” of policy.

Database Schema:



Foreign key from DAMAGE to EARTHQUAKE: Earthquake ID.

Constraints:

Earthquake

Name	*Data Type*	*Constraint*
Id	INT (primary key)	NOT NULL, Unique
Time	DATE	NOT NULL
Magnitude	INT	NOT NULL, 0-11
Hastsunami	BIT	NOT NULL
Year	DATE	NOT NULL
MONTH	DATE	NOT NULL
DAY	DATE	NOT NULL
Clusterid	INT (Foreign Key)	NOT NULLABLE
CityId	INT (Foreign key)	NOT NULLABLE

City

Name	*Data Type*	*Constraint*
CityId	INT (primary key)	NOT NULL, Unique
Long	INT	NOT NULL, 0-90
Name	VARCHAR(50)	NOT NULL
Lat	INT	NOT NULL, 0-180
Population	INT	NOT NULL, Unsigned

Policy: PolicyId

Name	*Data Type*	*Constraint*
PolicyId	INT (primary key)	NOT NULL, Unique
PolicyName	VARCHAR(50)	NOT NULL
Type	INT (Foreign Key)	
CompanyName	VARCHAR(50)	NOT NULL
CityCovered	INT (Foreign Key)	NULLABLE

We will include a price, which is derived as needed from the amount of damages and earthquakes in a region.

Type:

Name	*Data Type*	*Constraint*
TypeId	INT	Unique, NOT NULL
Name	VARCHAR(50)	NOT NULL
Pricemodifier	DOUBLE	Unsigned

Damage:

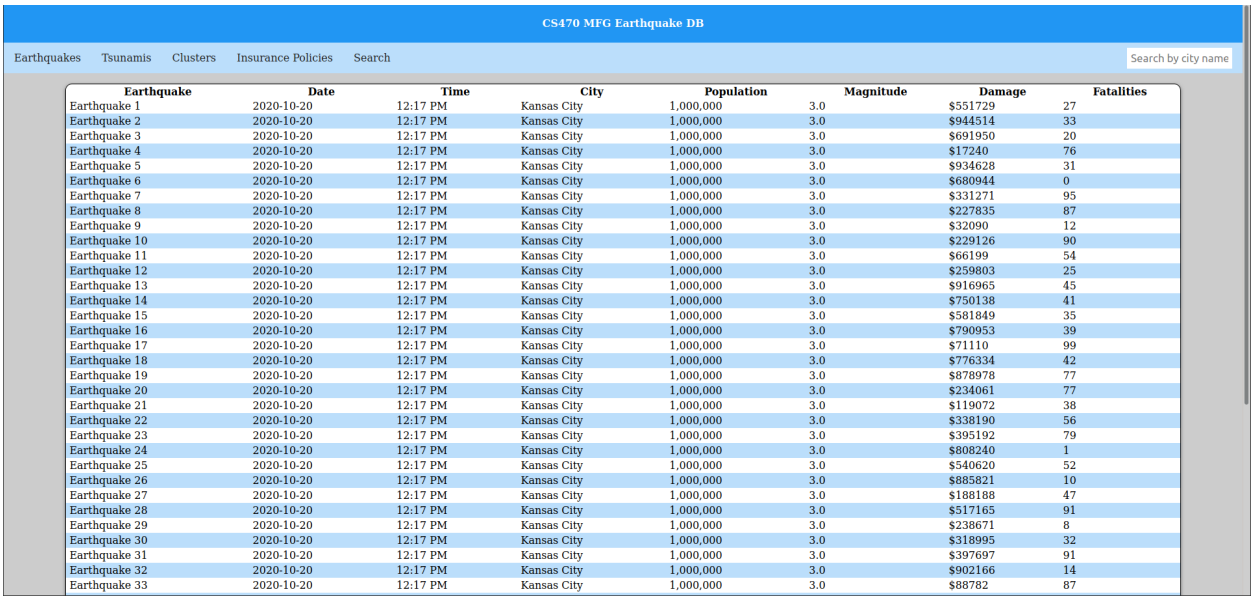
Name	*Data Type*	*Constraint*
Costs	INT	Unsigned
Fatality	INT	Unsigned
Tsunami	BIT	
Injuries	INT	Unsigned
EarthquakeId	INT	Foreign Key

Cluster:

Name	*Data Type*	*Constraint*
Clusterid	INT	NOT NULL, Unique

Front End Design (Presentation Tier):

The earthquake page (figure 1) will show the results of a SQL query, whether that's through pre-built queries accessed through the top panel or variable queries generated by user search.



Earthquake	Date	Time	City	Population	Magnitude	Damage	Fatalities
Earthquake 1	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$551729	27
Earthquake 2	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$944514	33
Earthquake 3	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$691950	20
Earthquake 4	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$17240	76
Earthquake 5	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$934628	31
Earthquake 6	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$680944	0
Earthquake 7	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$331271	95
Earthquake 8	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$227835	87
Earthquake 9	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$32090	12
Earthquake 10	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$229126	90
Earthquake 11	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$66199	54
Earthquake 12	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$259803	25
Earthquake 13	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$916965	45
Earthquake 14	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$750138	41
Earthquake 15	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$581849	35
Earthquake 16	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$790953	39
Earthquake 17	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$71110	99
Earthquake 18	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$776334	42
Earthquake 19	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$878978	77
Earthquake 20	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$234061	77
Earthquake 21	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$119072	38
Earthquake 22	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$338190	56
Earthquake 23	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$395192	79
Earthquake 24	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$808240	1
Earthquake 25	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$540620	52
Earthquake 26	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$885821	10
Earthquake 27	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$188188	47
Earthquake 28	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$517165	91
Earthquake 29	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$238671	8
Earthquake 30	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$318995	32
Earthquake 31	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$397697	91
Earthquake 32	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$902166	14
Earthquake 33	2020-10-20	12:17 PM	Kansas City	1,000,000	3.0	$88782	87

Figure 1

The search form (figure 2) is able to filter earthquake results by magnitude, longitude, latitude, date range. There will also be options to only return earthquakes if they caused fatalities, if they caused a tsunami, or if they were a part of a larger cluster of earthquakes.

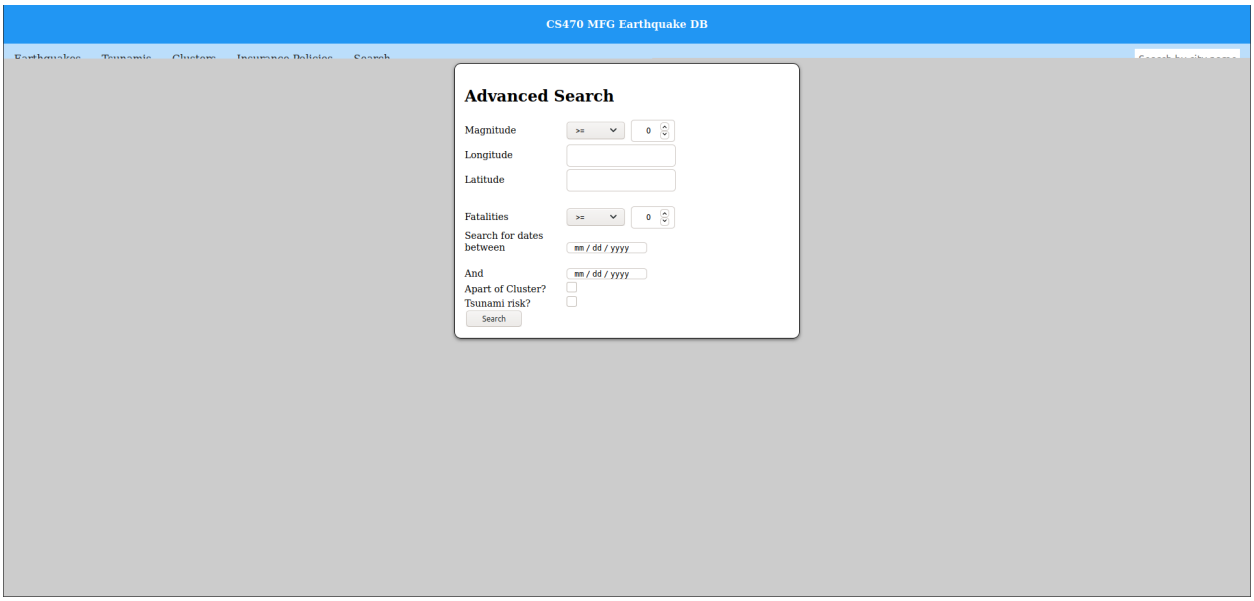


Figure 2

Relational Algebra Statements:

EARTHQUAKE

$$EARTHQDISPLAY \leftarrow EARTHQUAKE \bowtie_{(EARTHQUAKE.Cityid=CITY.Cityid)} CITY$$

$$\Pi_{(Date,Time,Name,Location,Population,Magnitude)}(EARTHQDISPLAY)$$

TSUNAMI

$$TSUNAMIDISPLAY \leftarrow \sigma_{Hastsunami=True}(EARTHQUAKE)$$

$$\Pi_{(Id,Date,Time,Magnitude)}(TSUNAMI)$$

POLICY

$$RESULT1 \leftarrow CITY \bowtie_{(CITY.Cityid=POLICY.Cityid)} POLICY$$

$$RESULT2 \leftarrow TYPE \bowtie_{(Typeid=Typeid)} (RESULT1)$$

$$\Pi_{(Policyid,Policyname,Companyname,TYPE.name,CITY.name)}(RESULT2)$$

CLUSTER

$$CLUSTERRESULT \leftarrow EARTHQUAKE \bowtie_{(EARTHQUAKE.Clusterid=CLUSTER.Clusterid)} (CLUSTER)$$

$$CLUSTERCOUNT \leftarrow_{Clusterid} F_{count(Earthquakeid)}(CLUSTERRESULT)$$

$$CLUSTERDISPLAY \leftarrow CLUSTERRESULT \bowtie CLUSTERCOUNT$$

$$\Pi_{(Clusterid,Count)} CLUSTERDISPLAY$$

CITY

$$CITYDISPLAY \leftarrow \Pi_{(Cityid,Location,Name,Population)}(CITY)$$

DAMAGE

$$DAMAGEDISPLAY \leftarrow EARTHQUAKE \bowtie_{(Earthquakeid=Id)} DAMAGE$$

$$\Pi_{(Costs,Injuries,Fatality,Tsunami,Id,Date)}(DAMAGEDISPLAY)$$