

### **What is our final project and what did it accomplish?**

Our project is a web-based system that manages a Minecraft-inspired database. Users can view and update player information, track achievements, and execute a variety of database operations through a clean and accessible interface. This project highlights our understanding of SQL concepts like joins, nested aggregations, and security best practices. It also gave us hands-on experiences applying database principles in a real-world context.

### **Differences Between Final Schema and Initial Schema**

1. The “Server,” “Join,” and “Save” tables were renamed to “Servers,” “Joined,” and “Saved” respectively to avoid conflicting with existing SQL function syntax.
2. The “type” attribute in the “InventoryItem2” and “PlacedBlock2” tables were renamed to “btype” and “ptype” respectively to avoid conflicting with existing SQL function syntax.
3. In CREATE TABLE for Build, attributes “bid” and “mid” are now set to ON DELETE CASCADE since they are part of the primary key. Originally, they were set to ON DELETE SET NULL.
4. In CREATE TABLE for Achieve, attribute “username” is now set to ON DELETE CASCADE since it is part of the primary key. Originally, it was set to ON DELETE SET NULL.
5. In CREATE TABLE for Play, attribute “username” is now set to ON DELETE CASCADE (was missing before).

### **Queries**

#### **Insert**

```
INSERT INTO PlayerHas (username, user_credentials, xp, email, skin, iid)
VALUES (:username, :user_credentials, :xp, :email, :skin, :iid)
```

#### **Update**

```
UPDATE PlayerHas SET email=:email, xp=:xp, skin=:skin WHERE username=:username
```

#### **Delete**

```
DELETE FROM PlayerHas where username=:username
```

#### **Selection**

```
SELECT *FROM Servers WHERE ${clauses}
```

#### **Projection**

```
“SELECT " + params + " from Mob1”
```

## Join

```
SELECT p.username, p.xp, p.email, a.aname, a.date_received, a.progress
FROM PlayerHas p
JOIN Achieve a ON p.username = a.username
WHERE p.username = :username
```

## Aggregation with Group by

- *For each achievement, view the number of players that have achieved it.*

```
SELECT aname, COUNT(*)
FROM Achieve
GROUP BY aname
```

## Aggregation with Having

- *Find number of saves for each join code where saved by at least half the players*

```
SELECT join_code, COUNT(*)
FROM Saved
GROUP BY join_code
HAVING COUNT(*) >= (0.5)*(SELECT COUNT(*) FROM PlayerHas)
```

## Nested Aggregation with Group by

- *For each achievement, show the average progress only if that average is greater than the overall average progress of all achievements.*

```
SELECT a.aname, AVG(a.progress) AS avg_progress
FROM Achieve a
GROUP BY a.aname
HAVING AVG(a.progress) > (
    SELECT AVG(a2.progress)
    FROM Achieve a2
)
```

## Division

- *Show achievements which have been achieved by all players.*

```
SELECT a.aname FROM Achievement a
WHERE NOT EXISTS(
    (SELECT p.username FROM PlayerHas p)
    MINUS
    (SELECT ac.username FROM Achieve ac WHERE ac.aname = a.aname)
)
```



Data in each relation after SQL initialization

Inventory		Servers			PlayerHats				Host		Participant		Joined		
id	remaining_slots	IPAddress	sname	player_capacity	username	user_credentials	xp	email	skin	id	username	username	IPAddress	participant_permissions	
1	17	123.456.1.1	server1	100000	Liv	/loveCP9C304	999999	lvia@student.ubc.ca	NULL	1	Liv	Liv	123.456.1.1		1
2	37	123.654.1.1	server2	65000	Alexi	/loveCP9C304	1000000	alexi3@student.ubc.ca	100	2	Alexi	Alexi	123.654.1.1		2
3	0	123.655.1.1	NULL	65000	Ruby	/loveCP9C304!	1000010	ruby@student.ubc.ca	200	3	Ruby	Ruby	123.655.1.1		3
4	27	123.656.1.1	NULL	75000	Someone	/loveCP9C304!	161	someone@student.ubc.ca	177	4	Someone	Someone	123.656.1.1		4
5	1	123.657.1.1	server	75000	Somebody	/loveCP9C304!	1000000	yo@student.ubc.ca	NULL	5	Somebody	MineCraftGenius	123.657.1.1		5
6	9						15000000	genius@student.ubc.ca	1000	6					
7	1				MineCraftGenius	genius									

WorldOpensHosts1				WorldOpensHosts2				
seed	difficulty	join_code	settings	host_permissions	wname	seed	IPaddress	username
-1106759604738884840	Easy	candy	Creative Mode	1	Giant Pale Garden	-1106759604738884840	123.456.1.1	Liv
-5584399987456711267	Peaceful	ballooon	Peaceful Mode	2	Sakura Season	-5584399987456711267	123.654.1.1	Alexi
-1754216045272489466	Normal	ffish	Exploration Mode	3	Frozen Edge Of The World	-1754216045272489466	123.655.1.1	Ruby
5101553622029575588	Hard	bannaa	Adventure Mode	4	Savanna Plateau River	5101553622029575588	123.656.1.1	Someone
4025804172371830787	Very Hard	geniuss	Hardcore Mode	5	Giant Mangrove Swamp	4025804172371830787	123.657.1.1	MineCraftGenius

Play				Saved		InventoryItem1			InventoryItem2		
username	join_code	start_time	end_time	join_code	username	bname	thumbnail	stacking_capacity	bid	bname	btype
Liv	candy	2025-02-28 10:49:00	2025-02-28 11:01:00	candy	Liv	Golden Apple	260	64	260	Golden Apple	Food
Alexi	ballooon	2025-02-28 10:48:00	2025-02-28 11:05:00	candy	Ruby	Diamond Block	264	64	264	Diamond Block	Mineral Block
Ruby	ffish	2025-03-17 20:43:01	2025-03-17 23:53:22	ballooon	Alexi	Bow	261	1	261	Bow	Weapons
Someone	bannaa	2025-03-02 22:00:00	2025-03-28 23:57:59	ballooon	Liv	Bucket	325	64	325	Bucket	Utility
Somebody	bannaa	2025-02-28 10:20:00	2025-03-01 15:20:00	ballooon	Ruby	Bread	295	64	295	Bread	Food
MineCraftGenius	geniuss	2025-04-07 23:30:00	2025-04-08 07:59:00	ballooon	MineCraftGenius						
				ballooon	Somebody						
				ffish	Alexi						
				ffish	Ruby						
				bannaa	Alexi						
				bannaa	Liv						
				bannaa	Someone						
				geniuss	MineCraftGenius						
				geniuss	Someone						
				geniuss	Somebody						

PlacedBlock1			PlacedBlock2			Mob1						Mob2		Store
bname	ptexture	block_physics	bid	bname	pptype	mname	mtexture	position	max_health	current_health	movement_speed	mid	mname	bid iid
Crafting Table	58	Flammable	145	Anvil	Utility	Creeper	3	155, 200, 145	20	20	35.1	92	Cow	260 1
Anvil	58	Falling	2	Clay	Build	Ocelot	3	156, 201, 0	10	10	15.0	93	Cow	264 2
Chipped Anvil	145	Falling	3	Clay	Build	Enderman	10	8, 0, 100	40	10	10.5	120	Villager	261 3
Clay	82	NULL	58	Crafting Table	Utility	Villager	115	15, 20, 45	20	1	5.2	58	Enderman	325 5
Red Tulip	1088	Transparent	10	Chipped Anvil	Utility	Cow	NULL	156, 201, 0	10	10	2.5	59	Enderman	295 6

Build			RecipeCraft1			RecipeCraft2			Achievement			Achieve		
join_code	bid	mid	resulting_block	ingredient_blocks		rname	resulting_block		aname	criteria		username	aname	date_received progress
candy	##	92	Golden Apple	Apple, Gold Nuggetx		Golden Apple Recipe	Golden Apple		Taking Inventory	Open your inventory.		Liv	Getting Wood	2025-03-02 100.00
ballooon	2	93	Diamond Block	Diamondx9		Diamond Block Recipe	Diamond Block		Getting Wood	Punch a tree until a block of wood pops out.		Liv	Playing Minecraft	2025-03-02 NULL
ffish	3	120	Bow	Stringx3, Stickx3		Bow Recipe	Bow		Playing Minecraft	NULL		Alexi	Getting Wood	NULL 0.00
bannaa	58	58	Bucket	Iron Ingotx3		Bucket Recipe	Bucket		Acquire Hardware	Smelt an iron ingot.		Someone	Bake Bread	NULL 98.01
geniuss	10	59	Bread	Wheatx3		Bread Recipe	Bread		Bake Bread	Turn wheat into bread.		Someone	Getting Wood	NULL 98.01
												Ruby	Acquire Hardware	2025-03-02 100.00
												Ruby	Getting Wood	2025-03-17 100.00
												Somebody	Getting Wood	2025-03-16 100.00
												MineCraftGenius	Getting Wood	2025-03-16 100.00

## **Copy of Schema**

Inventory(iid: INTEGER, remaining\_slots: INTEGER)

Servers(IPaddress: VARCHAR(15), sname: VARCHAR(255), player\_capacity: INTEGER)

PlayerHas(username: VARCHAR(16), user\_credentials: VARCHAR(255), xp: INTEGER,  
email: VARCHAR(255), skin: INTEGER, **iid**: INTEGER)

- email is a CANDIDATE KEY.

Host(username: VARCHAR(16))

Participant(username: VARCHAR(16))

Joined(username: VARCHAR(16), participant\_permissions: VARCHAR(255), **IPaddress**:  
VARCHAR(15))

WorldOpensHosts1(seed: INTEGER, difficulty: VARCHAR(255))

WorldOpensHosts2(join\_code: VARCHAR(255), wname: VARCHAR(255), **seed**: INTEGER,  
Settings: VARCHAR(255), **IPaddress**: VARCHAR(15), host\_permissions:  
VARCHAR(255), **username**: VARCHAR(16))

Play(username: VARCHAR(255), **join\_code**: VARCHAR(255), start\_time: TIMESTAMP(0),  
end\_time: TIMESTAMP(0))

Saved(join\_code: VARCHAR(255), username: VARCHAR(16))

InventoryItem1(bname: VARCHAR(255), stacking\_capacity: INTEGER, thumbnail:  
INTEGER)

InventoryItem2(**bname**: VARCHAR(255), bid: INTEGER, btype: VARCHAR(255))

PlacedBlock1(bname: VARCHAR(255), block\_physics: VARCHAR(255), ptexture:  
INTEGER)

PlacedBlock2(**bname**: VARCHAR(255), bid: INTEGER, ptype: VARCHAR(255))

Mob1(mname: VARCHAR(255), mtexture: INTEGER, position: VARCHAR(255), max\_health:  
INTEGER, current\_health: INTEGER, movement\_speed: DECIMAL)

Mob2(mid: INTEGER, **mname**: VARCHAR(255))

Store(**bid**: INTEGER, **iid**: INTEGER)

Build(**bid**: INTEGER, **join\_code**: VARCHAR(255), **mid**: INTEGER)

RecipeCraft1(**resulting\_block**: VARCHAR(255), ingredient\_blocks: VARCHAR(255))

RecipeCraft2(rname: VARCHAR(255), **resulting\_block**: VARCHAR(255))

Achievement(aname: VARCHAR(255), criteria: VARCHAR(255))

Achieve(username: VARCHAR(16), **aname**: VARCHAR(255), date\_received: DATE,  
progress: DECIMAL)