1. Analisi dei requisiti

1.1 Intervista

Exchange di cripto:

Si vuole realizzare un database di più Exchange di criptovalute. Lo scopo di un Exchange è dare la possibilità agli utenti di poter scambiare valute legali (Euro, Dollaro, etc...) in criptovalute, tenendo traccia degli scambi tra una valuta ed un’altra.

Si vuole tenere traccia dei dipendenti e supervisori, che lavorano in un determinato Exchange, questi lavoratori posso anche essere registrati come utenti nell’ Exchange in cui lavorano. Si vuole poi tenere traccia degli utenti che si registrano agli Exchange, memorizzando: Nome, Cognome, E-mail, Data di nascita, Codice fiscale, Nazionalità, numero di telefono, Password. Ad ogni utente al momento della registrazione viene creato un primo conto corrente, contenente la valuta FIAT (valuta legale) del paese dell’utente registrato, dove potrà depositare i suoi primi soldi, poi eventualmente potrà creare più conti correnti sempre della stessa valuta oppure anche di valute diverse ma sempre FIAT, inoltre può anche creare dei Wallet che sono dei conti che possono solo contenere Crypto. Ogni entità conto può effettuare transazioni che posso essere o in entrata o in uscita, di conseguenza pure Conto Corrente e wallet, che sono sotto entità. Appena un utente vuole fare uno scambio, es. 1000$ per 0.1 Bitcoin, deve effettuare un ordine, ed aspettare che qualcuno faccia l’ordine speculare, ossia: possiede 0.1 Bitcoin e voglia 1000$. Appena viene effettuato lo scambio vengono create 2 transazioni (una che sposta 1000$ da un conto corrente ad un altro, e uno che sposta 0.1 BTC in un altro wallet). Tutte le transazioni (prese 2 a 2) però non corrispondono per forza ad uno scambio, poiché un utente può inviare soldi ad un altro utente senza avere una valuta in cambio. La super entità Valuta contiene due attributi il Ticker che è del testo, univoco a cui corrisponde la valuta (es. EUR, USD; BTC, ...) e il nome completo di tale valuta. Un Exchange inoltre possiede degli ATM, i quali permettono di depositare o prelevare qualsiasi moneta FIAT con una commissione, che può variare da differenti ATM e anche per lo stesso ATM può variare nel tempo, ma non siamo interessati ad immagazzinare lo storico.

1.2 Ambiguità e correzioni proposte

Le criptovalute, soprattutto Bitcoin hanno un database decisamente differente per immagazzinare le informazioni sulle transazioni, chiamato blockchain, ed è distribuito tra vari nodi di calcolo, cosa ben lontana da un singolo database MySQL, però si può emulare con molta facilità anche con un database relazionale, poiché per il progetto non abbiamo bisogno di convalidare le transazioni, come viene fatto nella realtà.

Nella realtà in un Exchange per far sì che gli scambi siano effettuati bisogna che ci sia un altro utente che effettui l’ordine opposto, ovviamente questa cosa nel progetto non è possibile quindi verrà simulato un altro utente che effettuerà l’ordine, per far sì che lo scambio sia effettuato.

Ogni Utente per registrarsi agli Exchange deve inserire, i propri dati personali per ogni Exchange; quindi, in caso si registrasse in più Exchange e siccome i dati personali sono sempre gli stessi, ad eccezione l’e-mail e la password per registrarsi, provoca ridondanza nel database. Di conseguenza ho deciso di separare i dati personali dell’utente con e-mail e password per

1.3 Specifiche del linguaggio

1.3.1 Valuta Fiat

Una valuta fiat è una valuta che viene emessa da una autorità (banca centrale / Stato), di cui ne garantisce la stabilità (<https://it.wikipedia.org/wiki/Moneta_legale>). Per intenderci sono le valute tradizionali come Euro, Dollaro, e tutte le altre monete usate principalmente negli stati.

1.3.2 Criptovaluta

Una criptovaluta è una valuta di cui nessuno può garantirne stabilità poiché priva di autorità regolatrice (in generale, poi non è escluso che magari qualcuna lo sia), però tramite blockchain e calcolo distribuito, si può evitare che venga creata valuta dal nulla (aumentarne l’offerta e quindi svalutazione). (<https://it.wikipedia.org/wiki/Criptovaluta>)

1.3.3 Exchange

Un Exchange di criptovalute, come suggerisce il nome è una piattaforma che permette lo scambio delle due valute citate precedentemente. Possiede alcune assomiglianze ad una borsa finanziaria (<https://it.wikipedia.org/wiki/Borsa_valori>)

1.3.4 Estrazione concetti principali

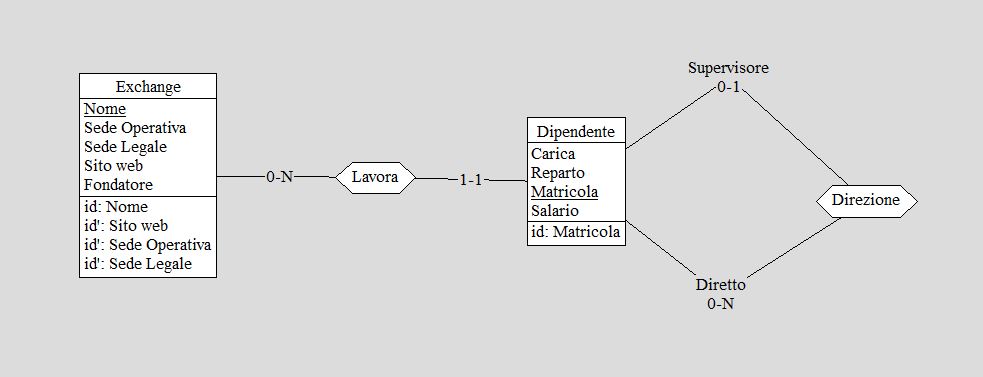
Si vuole tenere traccia dei **dipendenti** e **supervisori**, che lavorano in un determinato **Exchange**, questi lavoratori posso anche essere registrati come utenti nell’ Exchange in cui lavorano. Si vuole poi tenere traccia degli **utenti** che si registrano agli Exchange, memorizzando: Nome, Cognome, E-mail, Data di nascita, Codice fiscale, Nazionalità, numero di telefono, Password (in hash). Ad ogni utente al momento della registrazione viene creato un primo **conto corrente**, contenente la **valuta** **FIAT** (valuta legale) del paese dell’utente registrato, dove potrà depositare i suoi primi soldi, poi eventualmente potrà creare più conti correnti sempre della stessa valuta oppure anche di valute diverse ma sempre FIAT, inoltre può anche creare dei **Wallet** che sono dei conti che possono solo contenere **Crypto**. Ogni entità conto può effettuare **transazioni** che posso essere o in entrata o in uscita, di conseguenza pure Conto Corrente e wallet, che sono sotto entità. Appena un utente vuole fare uno **scambio**, es. 1000$ per 0.1 Bitcoin, deve effettuare un ordine, ed aspettare che qualcuno faccia **l’ordine** speculare, ossia: possiede 0.1 Bitcoin e voglia 1000$. Appena viene effettuato lo scambio vengono create 2 transazioni (una che sposta 1000$ da un conto corrente ad un altro, e uno che sposta 0.1 BTC in un altro wallet). Tutte le transazioni (prese 2 a 2) però non corrispondono per forza ad uno scambio, poiché un utente può inviare soldi ad un altro utente senza avere una valuta in cambio. La super entità **Valuta** contiene due attributi il Ticker che è del testo, univoco a cui corrisponde la valuta (es. EUR, USD; BTC, ...) e il nome completo di tale valuta. Un Exchange inoltre possiede degli **ATM**, i quali permettono di depositare o prelevare qualsiasi moneta FIAT con una commissione, che può variare da differenti ATM e anche per lo stesso ATM può variare nel tempo, ma non siamo interessati ad immagazzinare lo storico.

2. Progettazione Concettuale

2.1 Schema scheletro

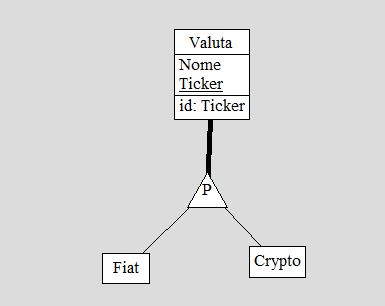
2.1.1 Exchange

Gli Exchange vengono modellati come delle entità di cui si vuole immagazzinare Nome, Sede operativa, Sede Legale, Sito web, Fondatore e le persone che vi lavorano. La gerarchia tra dipendenti è ad albero. Per ogni Dipendente vogliamo immagazzinare Carica, Reparto, Matricola, Salario.



2.1.2 Valuta

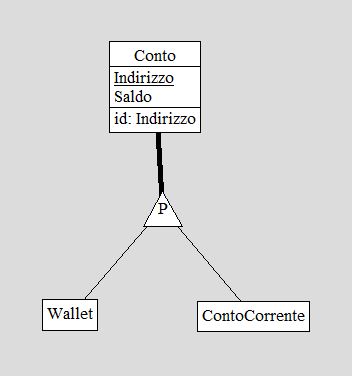
Le valute sono di 2 tipi, cripto e fiat. Non esiste una valuta che può essere entrambe, ed è altamente difficile che venga aggiunto un ulteriore tipo di valuta. Il Tinker è chiave primaria, ed è una striga univoca che identifica la valuta, es. euro: EUR, dollaro statunitense: USD, Bitcoin: BTC e così via.



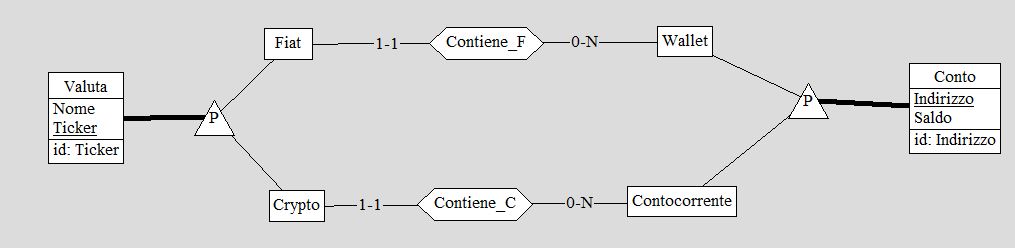
Di conseguenza ho deciso di creare una super entità valuta, come copertura ho deciso di una totale, esclusiva, poiché calza con le specifiche del dominio.

2.1.3 Conto

Il conto serve per contenere le valute sopracitate, wallet contiene cripto, conto corrente contiene una valuta fiat. Di conseguenza seguo lo schema della valuta.

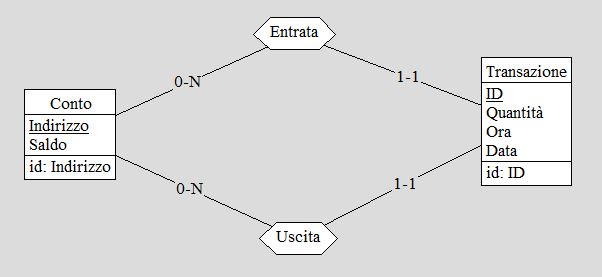


Di seguito segue una immagine che descrive la relazione tra i conti e le valute

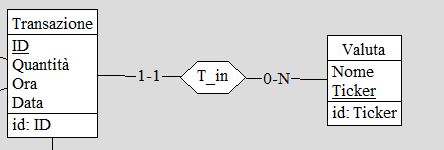


2.1.4 Transazioni

Per modellare le transazioni ho deciso di creare una entità, e due relazioni verso un conto generico, poiché un conto può avere una transazione in entrata e una in uscita. Mentre per la transazione si relaziona a 2 conti, poiché i soldi che sono in uscita da un conto sono in entrata ad un altro.

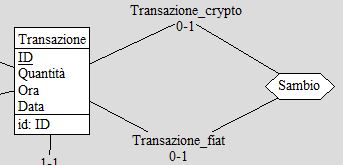


La transazione avviene in una valuta di riferimento, di conseguenza, creo una relazione con la super entità Valuta.



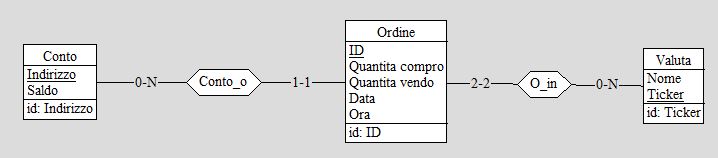
2.1.5 Scambio

Per far sì che una valuta possa essere scambiata con un’altra, vi deve essere appunto 2 transazioni, una per valuta. Di conseguenza per tenere traccia delle transazioni che costituiscono uno scambio, ma non tutte necessariamente ne fanno parte.



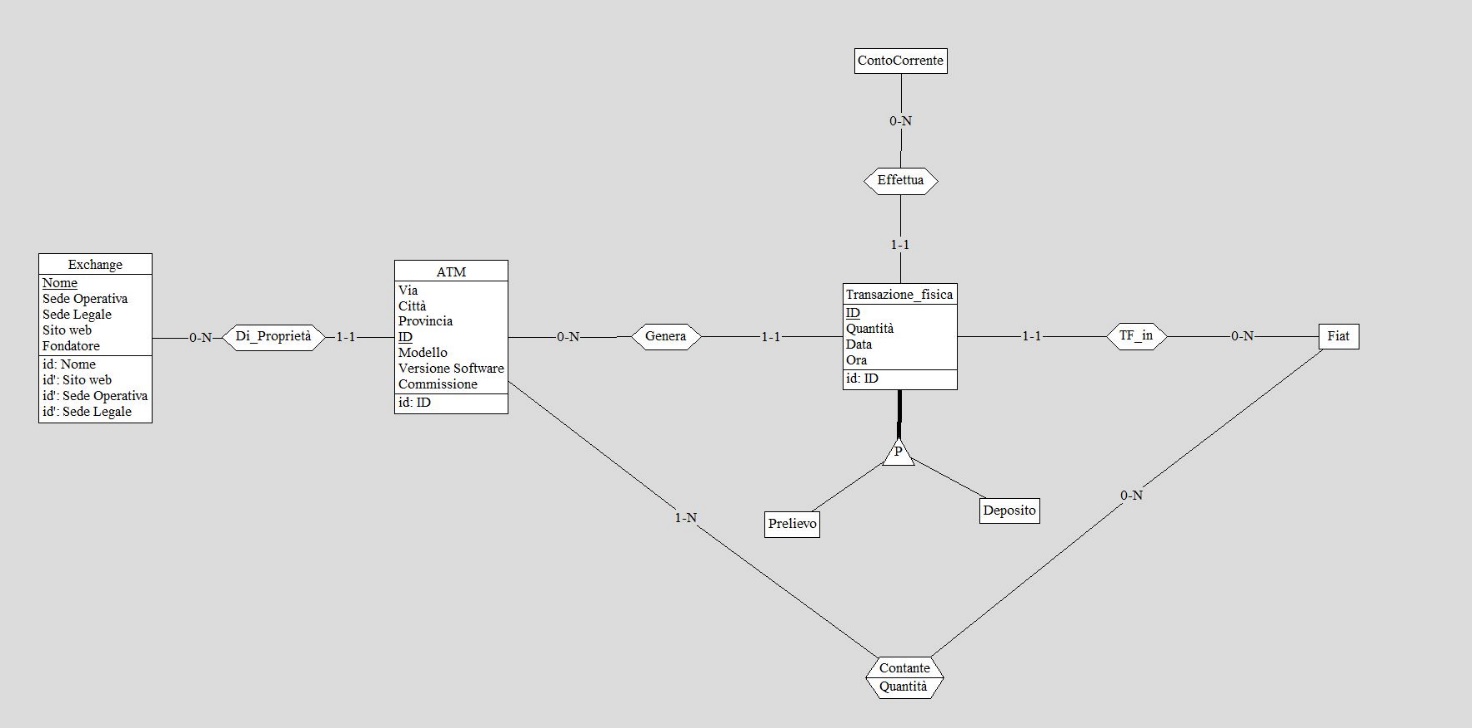
2.1.6 Ordine

Gli ordini sono collegati ad un conto, e tengono traccia delle 2 valute, in cui si vuole fare lo scambio.



2.1.7 ATM

Ogni ATM è posseduto da un Exchange, inoltre possono possedere più di una valuta prelevabile e depositabile, di conseguenza viene creata una relazione con l’entità fiat.  
Con le classiche operazioni da ATM: prelievo, deposito viene associata una super entità Transazione Fisica che tiene traccia di che operazione è stata effettuata e in quale valuta.

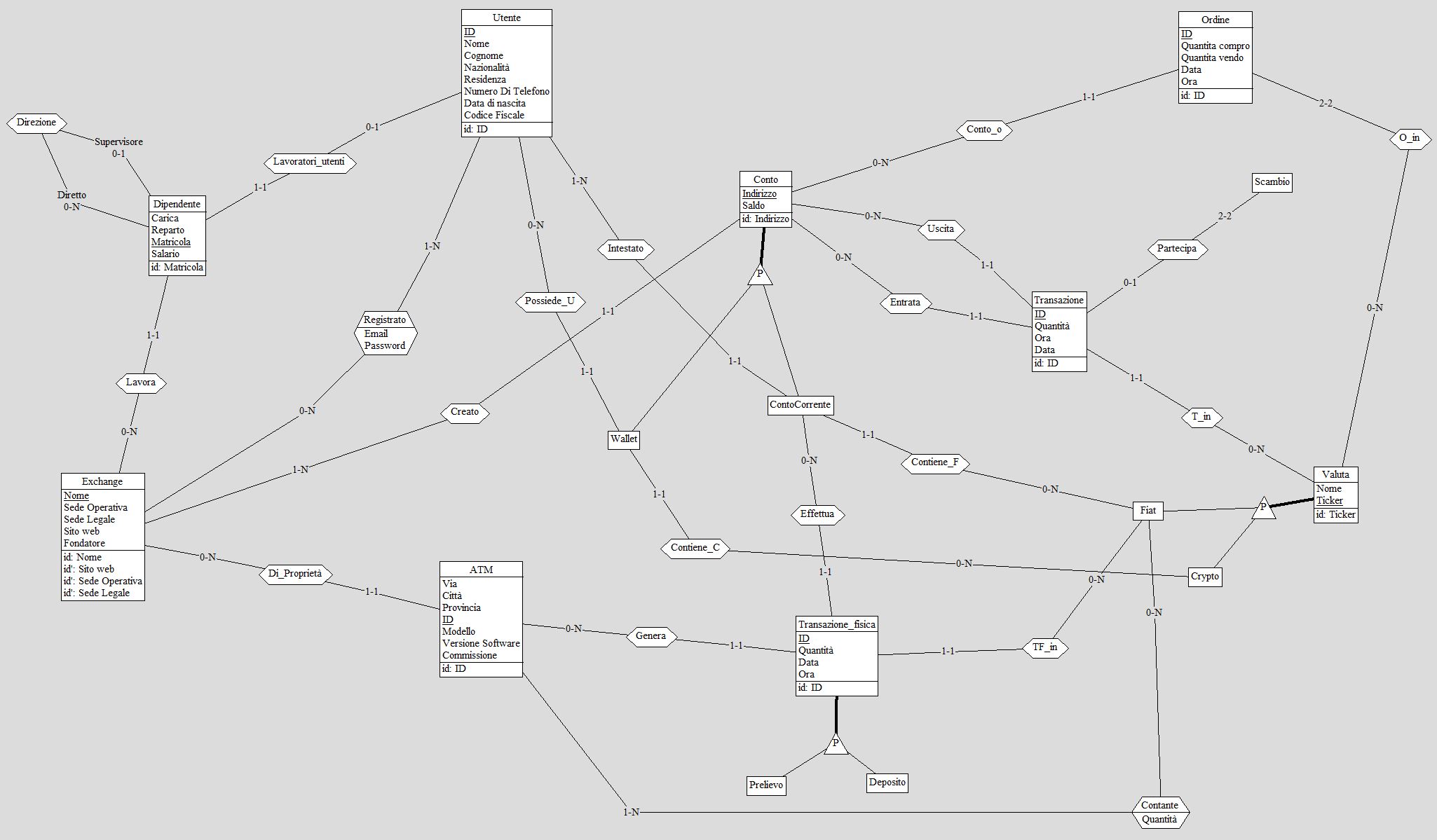


2.1.8 Utenti

Gli utenti appena registrati possiedono un conto corrente, dunque, la cardinalità è 1-N poi possono creare successivamente nuovi wallet. Ogni utente può essere registrato a più Exchange, con differenti e-mail e password, infine un utente al massimo può anche lavorare per un Exchange a cui è per forza registrato, di conseguenza si ha la relazione 0-1 con i dipendenti, mentre un dipendente è in automatico registrato poiché sarà nel conto corrente di default in cui è registrato che verrà caricato lo stipendio, e le informazioni personali sono le stesse di quelle immagazzinate per un utente.

![Diagram

Description automatically generated](data:image/jpeg;base64,/9j/4AAQSkZJRgABAQEAYABgAAD/4RD6RXhpZgAATU0AKgAAAAgABAE7AAIAAAAQAAAISodpAAQAAAABAAAIWpydAAEAAAAgAAAQ0uocAAcAAAgMAAAAPgAAAAAc6gAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAE1hcmNvIERpIFBpZXRybwAABZADAAIAAAAUAAAQqJAEAAIAAAAUAAAQvJKRAAIAAAADNzEAAJKSAAIAAAADNzEAAOocAAcAAAgMAAAInAAAAAAc6gAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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tNuUInUEspDRgqBg5Y4UYIJ4oW1l/X9X/H0B78z/r+rfh6nQUVxPiH4iWtno8t3okkMptbq1W6a+jlgVbeWYRmaPcoEq8nDKdvfccYPSaLr+neIIJpdLmkf7PKYZo5oJIJInwDho5FVl4IIyOQQaFqr/1/WoPQ0qKKKACiiigDh7v/AJKnq3/YF0//ANH3taFZ93/yVPVv+wLp/wD6Pva0KACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKAMTTLC51XRviFp9gkD3F3fmBBcOUjy+nWq/MQrHHPoarXXg3xh9mubOwOiiO+1Cz1N57i5mZrWWIxF0CCMecn7kYO6M84OOtXtD1S30Wy8d6jeXsFhDbamHNzcIXSM/YLTBKggtzj5QQT0HJq14p8fJok2mWWneXd3tzfWdvcMbefyokmkVSdyqUVyDkI7qcEHngMR0lpvp+en4/wBbje2vS/8AwTrWa6F5CqRQtbFGMsplKurcbQqbSCDzklhjA4OeOc8WaPq2si4sxpeia1pFxAiGy1SZovLlBfMgZYpM8FMDggrkEVqaRqd3PGkWr20kN3JNchBHbSCMRxysqFm5VSU2nkjdkkDHTE8R+LL3TvGlloVpc6XYtcWvnwf2mHA1CTft8iKQMAjDgk4c/OMIcGk0no+v9f1/mCurvt/X9f5GTd+Bdf8Asr2lvLY3ax6VY2kd3dXUiyzy283mfOBG21WywzuYj0OTixceDtevLrUrOY6culaxe2+oXL/aJGntJU8svHGNgEikwrtclCu4nacAV0T+KLXTItPg8QubbULiKIzpDBJJFA74X53UFY1L5VS5AODgnBrL1Hx2kfjrRfD+mKk6Xd1Nb3k7wzBUKQu+2OTZ5TMCoDDeSvI25yVrXm89fzu/xt+Hznp/Xa35Gz4q0WXX/Ds9naTi2vVZZ7O4YEiGdGDRscdRuAyO4yKydO8Dmy1S/d75pbK8h3mIj5lu3QxzT+gLLt49S/rWzpXiXS9bup7fTp5HlgUORJbyRB0JIDoXUCRDg4dMqfWsdtb13Xte1Wx8Ly6dZW+kSrbz3N/bSXHnzlFcoqpJHsChlyxLZJxgYyZsnp3/AK/y/Dsitnft/X9fM5+z+G13aeGpLS20rw5p9/ALdY57CLyvt/kzRyh5mEQaMt5QG0bwCxOWwK7Hw9pF5aXmp6pqwt47/U5UeSC1kMkcKogRVDsqlzwSSVXrjHGTi6d8U9Alto4tYmFjrG6eOXS4Ve5mDQyFJNqxqWZcgkHaCVBOPlbG1J4z0GNLGT7cZIr9I5IZoYJJIwkhwjO6qVjDHgFyoJBA6Gqu3/Xf/O3+RNraf1/SNyiuZj+InheeC5ntNRe7htZPJkltbSaZPM3hPLVkQhnLEYRcsQQQMc1C/wAR9C+06UkMlxJBqSzsLj7JMFgER2v5gKZjw2Qd+3bgk4qb6XH1sdZRXLaV490a7twjX8l5cR6cuoyy22l3KRvARkSICrdcHChmbII6g1ZtPHGgX2rwaZb3Nx9quMCNZLKeNS3l+bsLsgUPs+YoSGA6iqtrYNjHu/8Akqerf9gXT/8A0fe1oVn3f/JU9W/7Aun/APo+9rQpAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAYmmWFzqujfELT7BIHuLu/MCC4cpHl9OtV+YhWOOfQ1WuvBvjD7Nc2dgdFEd9qFnqbz3FzMzWssRiLoEEY85P3Iwd0Z5wcdavaHqlvotl471G8vYLCG21MObm4QukZ+wWmCVBBbnHyggnoOTVrxT4+TRJtMstO8u7vbm+s7e4Y28/lRJNIqk7lUorkHIR3U4IPPAYjpLTfT89Px/rcb216X/AOCdazXQvIVSKFrYoxllMpV1bjaFTaQQecksMYHBzxznizR9W1kXFmNL0TWtIuIEQ2WqTNF5coL5kDLFJngpgcEFcgitTSNTu540i1e2khu5JrkII7aQRiOOVlQs3KqSm08kbskgY6YniPxZe6d40stCtLnS7Fri18+D+0w4GoSb9vkRSBgEYcEnDn5xhDg0mk9H1/r+v8wV1d9v6/r/ACMgfDOSLUbRrm00XXF+wW9pLf6rbh7m2eIEebFuRw+4HO1iuCActkimt4H8T+bp+mJLpQ0qx1S5uxevNK1w8UyyhkMOwLvHnsA/mY4B2/w11r+KLXTItPg8QubbULiKIzpDBJJFA74X53UFY1L5VS5AODgnBrL1Hx2kfjrRfD+mKk6Xd1Nb3k7wzBUKQu+2OTZ5TMCoDDeSvI25yVp6uz13/wCCJaK67foJ4F8Gt4ZUedpGg2E0NuLb7RpMCq96AR+9lPlqVPyj5AzDJJyeMStomu6Dr2q33heLTr231eVbie2v7mS38icIqF1ZI5N4YKuVIXBGcnOBsaV4l0vW7qe306eR5YFDkSW8kQdCSA6F1AkQ4OHTKn1qjo2pazdeM9dsL64sXsLDyhAkNo6SnzF3Dc5kYHAyOFGevHShtt3YKy0OImsrvwh428M6XpV3peoa1dQ6nc3Iv7o2gnkmkicsoVZGHKnauD8qHnIJq5afCr7BdWivp+g6vGbOGCa81C2BntJELEyQKyOGDbiQrFdpAOW6V3M3iXSoNcj0iWeRbuRti/6PIYt+3cEMu3YHKjOwtuxg45FZcXxI8LzXEsUd9cYht5LppjYXAhaFPvSLKY9jLkYBUkMcAZyKSei8v+D+Vwev9d/8yhBoXi218NarbWb6faX1zqr3cTQ3jkPC8u90LtAfLbbkZCN6jB5Gd4d8GeJdBOmSrBpkz2V1fsY31Od8xXLhwfMaEszqQQcjnruycVut41W/vNJ/sAJLazam1jf/AGyGa3ngbyWkCiJ1Ugn5TluMHgHORr6V4l0vW7qe306eR5YFDkSW8kQdCSA6F1AkQ4OHTKn1pJaW+X4L9Ab1/H72/wDgnNad4I1FdH8Nx3U1tZXWmwtZ3yWkjSR3NqRzGGKqeSkZ6DALAdc1FqnhfxVqHj6w1aSazuNP0/URcW6vfyR7IDCY2TyViKlwWLB2ZiegKAmu/oqr63/r+v8Ag9w3TRw93/yVPVv+wLp//o+9rQrPu/8Akqerf9gXT/8A0fe1oUgCiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKAMTTLC51XRviFp9gkD3F3fmBBcOUjy+nWq/MQrHHPoarXXg3xh9mubOwOiiO+1Cz1N57i5mZrWWIxF0CCMecn7kYO6M84OOtWrey8R6Xqmqz6Hq2lxW+pXS3TRXmmSTOjCGKIgMs6AjEQP3e5q19r8b/8AQa8P/wDgkn/+S6Fo7r+rO/5g9VY7FmuheQqkULWxRjLKZSrq3G0Km0gg85JYYwODnjnPFmj6trIuLMaXomtaRcQIhstUmaLy5QXzIGWKTPBTA4IK5BFUftfjf/oNeH//AAST/wDyXR9r8b/9Brw//wCCSf8A+S6TSasxp22M8fDOSLUbRrm00XXF+wW9pLf6rbh7m2eIEebFuRw+4HO1iuCActkimt4H8T+bp+mJLpQ0qx1S5uxevNK1w8UyyhkMOwLvHnsA/mY4B2/w1pfa/G//AEGvD/8A4JJ//kuj7X43/wCg14f/APBJP/8AJdN+9v8A1cS02/rSxN4F8Gt4ZUedpGg2E0NuLb7RpMCq96AR+9lPlqVPyj5AzDJJyeMMaw8ZWXiTXb7StP0OSPUTGIJLjU5laPYm0MyC3IPrtDe2e9M+1+N/+g14f/8ABJP/APJdH2vxv/0GvD//AIJJ/wD5Loeu4Ky2IY/A32LxVeard6Xol7HJOt9/aj2ge/jZUXdEq+WdwJXhgwIDEBc4Ncr4On1C7jNv4e1HSby//sx7exntdWW6XSVIDKjRC2HlqWVV/eNKwKgfMA1dh9r8b/8AQa8P/wDgkn/+S6Ptfjf/AKDXh/8A8Ek//wAl0LT+vl+X9ah/X6mJZeBPFMVzcfaItNaG71Vb6V5NYnnlVTbGBwGa3G487gPlX+EBQBXQ+BfBreGVHnaRoNhNDbi2+0aTAqvegEfvZT5alT8o+QMwyScnjEP2vxv/ANBrw/8A+CSf/wCS6Ptfjf8A6DXh/wD8Ek//AMl01pt/WlvyB67/ANdTuKK4f7X43/6DXh//AMEk/wD8l0fa/G//AEGvD/8A4JJ//kukAXf/ACVPVv8AsC6f/wCj72tCsnT9P1Ua/e6vrl/Z3dxc2sFqq2dk1uiLE0rAkNLISSZj3HQVrUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQB//2Q==)

2.2 Schema concettuale finale  
  


3. Progettazione logica

3.1 Stima volume dei dati

|  |  |  |
| --- | --- | --- |
| Utente | E | 1.000.000 |
| Registrato | R | 3.000.000 |
| Dipendente | E | 200.000 |
| Exchange | E | 20 |
| ATM | E | 150.000 |
| Contante | R | 7.500.00 |
| Prelievo | E | 50.000.000 |
| Deposito | E | 50.000.000 |
| Conto Corrente | E | 40.000.000 |
| Wallet | E | 50.000.000 |
| Transazione | E | 500.000.000 |
| Scambio | E | 75.000.000 |
| Ordine | E | 3.000.000 |
| Fiat | E | 50 |
| Crypto | E | 5000 |

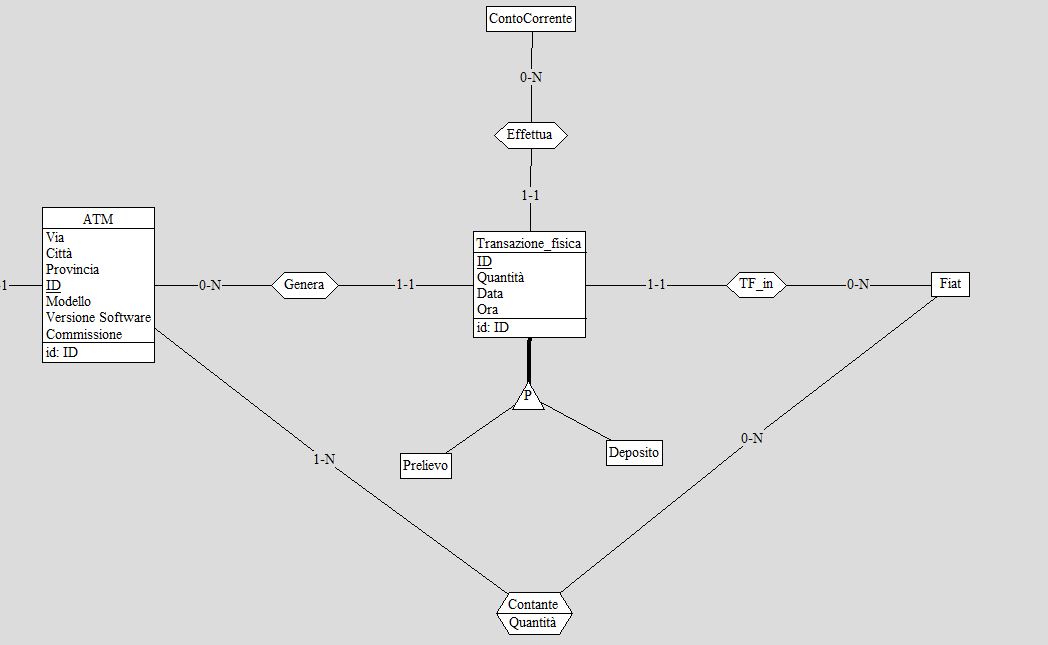
3.2 Descrizione operazioni principali

|  |  |  |
| --- | --- | --- |
| 1 | Deposito di fondi su un conto corrente | 4 a settimana |
| 2 | Prelievo di fondi dal conto corrente | 4 a settimana |
| 3 | Immagazzinamento di un ordine | 1 al giorno |
| 4 | Effettuare uno scambio tra valute | 2 al giorno |
| 5 | Report dei conti di un utente | 4 al giorno |
| 6 | Creare un wallet | 10 al mese |
| 7 | Creare un conto corrente | 15 al mese |
| 8 | Aggiungere un Exchange | 1 al mese |
| 9 | Aggiungere una valuta fiat | 1 all’anno |
| 10 | Registrazione ad un Exchange | 100 alla settimana |
| 11 | Accesso ad un Exchange | 100.000 al giorno |

3.3 Schemi di navigazione e tabelle degli accessi

**OP. 1 Deposito fondi su un conto corrente**

Per fare un deposito devo sapere quali commissioni ha l’ATM quindi faccio una lettura, poi aggiungo la somma depositata al conto corrente, sottratte le commissioni, poi aggiungo la somma di denaro all’ATM.



|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| ATM | E | 1 | L |
| Conto Corrente | E | 1 | L |
| Conto Corrente | E | 1 | S |
| Contante | R | 1 | L |
| Contante | R | 1 | S |
| Transazione Fisica | E | 1 | S |

***Totale: 3L + 3S = 9 accessi  
Frequenza: 9 \* 4 = 36 accessi a settimana***

**OP. 2 Prelievo fondi sul conto corrente**

Per fare un prelievo devo sapere quali commissioni ha l’ATM quindi faccio una lettura, poi sottraggo la somma prelevata al conto corrente, sottratte le commissioni, poi sottraggo la somma di denaro all’ATM.

![Diagram

Description automatically 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|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| ATM | E | 1 | L |
| Conto Corrente | E | 1 | L |
| Conto Corrente | E | 1 | S |
| Contante | R | 1 | L |
| Contante | R | 1 | S |
| Transazione Fisica | E | 1 | S |

***Totale: 3L + 3S = 9 accessi  
Frequenza: 9 \* 4 = 36 accessi a settimana***

**OP. 3 Immagazzinamento di un ordine**

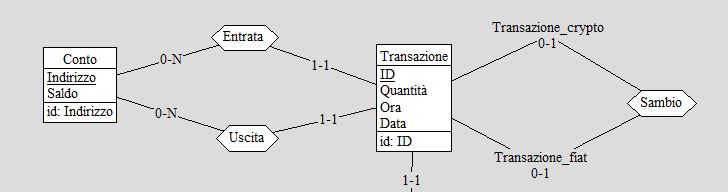
Quando si vuole eseguire uno scambio, si cerca se un ordine speculare esiste, se non viene trovato immagazzineremo l’ordine nella tabella, dunque una lettura della tabella, poi una scrittura poiché non è stato trovato un ordine speculare.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Ordine | E | 1 | L |
| Ordine | E | 1 | S |

***Totale: 1S + 1L = 3 accessi  
Frequenza: 3 \* 1 = 3 accessi al giorno***

**OP. 4 Effettuare uno scambio tra valute**

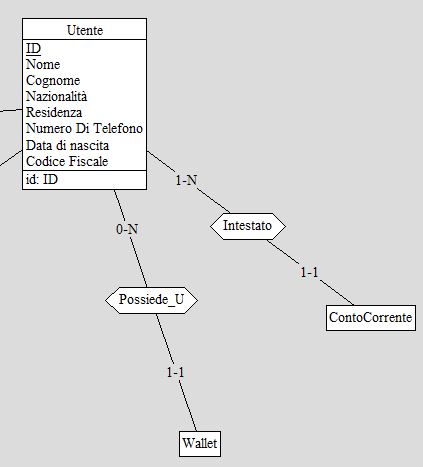
Caso in cui viene trovato un ordine speculare, effettuo lo scambio, eseguo la transazione, aggiornamento dei saldi dei due conti correnti, e aggiornamento dei saldi dei due wallet.



|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Ordine | E | 1 | L |
| Transazione | E | 2 | S |
| Conto corrente | E | 2 | L |
| Conto corrente | E | 2 | S |
| Wallet | E | 2 | L |
| Wallet | E | 2 | S |
| Scambio | E | 1 | S |

***Totale: 5L + 7S = 19 accessi  
Frequenza: 2 \* 19 = 38 accessi al giorno***

**OP. 5 Report conti di un utente**

Per sapere in media quanti conti possiede un utente, dobbiamo sommare i wallet e conti correnti e dividerlo per il numero di utenti e di Exchange.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Conto corrente | E | 2.5 | L |
| Wallet | E | 2 | L |

***Totale: 4.5L = 4.5 accessi  
Frequenza: 4.5 \* 4 = 18 accessi al giorno***

**OP. 6 Creazione wallet**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Wallet | E | 1 | S |

***Totale: 1S = 2 accessi  
Frequenza: 2 \* 10 = 20 accessi al mese***

**OP. 7 Creazione Conto corrente**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Conto Corrente | E | 1 | S |

***Totale: 1S = 2 accessi  
Frequenza: 2 \* 15 = 30 accessi al mese***

**OP. 8 Aggiungere un Exchange**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Exchange | E | 1 | S |

***Totale: 1S = 2 accessi  
Frequenza: 2 \* 1 = 2 accessi al mese***

**OP. 9 Aggiungere una valuta fiat**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Fiat | E | 1 | S |

***Totale: 1S = 2 accessi  
Frequenza: 2 \* 1 = 2 accessi al mese***

**OP. 10 Registrazione ad un Exchange**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Exchange | E | 1 | S |

***Totale: 1S = 2 accessi  
Frequenza: 2 \* 100 = 2 accessi a settimana***

**OP. 11 Accesso ad un Exchange**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Exchange | E | 1 | L |

***Totale: 1S = 1 accessi  
Frequenza: 1 \* 100.000 = 100.000 accessi a settimana***

3.4 Raffinamento dello schema

3.4.1 Eliminazione di identificatori esterni

**Nello schema E/R sono eliminate le seguenti relazioni:**

* Lavora, importando il nome dell’Exchange in Dipendente
* Direzione, importando la matricola del dipendente del supervisore (in Dipendente)
* Lavoratori utenti, importando l’ID dell’utente
* Contiene\_F, importando il Tinker della valuta Fiat in conto corrente
* Contiene\_C, importando il Tinker della criptovaluta in wallet
* Entrata, importando indirizzo del conto in transazione
* Uscita, importando indirizzo del conto in transazione
* T\_in, importando il Tinker della valuta in transazione
* Conto\_o, importando indirizzo del conto in Ordine
* O\_in, importando due volte il Tinker di due valute
* Effettua, importando l’indirizzo del conto
* TF\_in, importando il Tinker della valuta Fiat in Transazione fisica
* Genera, importando L’ID dell’ATM
* Possiede\_U, importando l’ID dell’utente
* Intestato, importando l’ID dell’Utente

3.4.2 Eliminazione delle gerarchie

La gerarchia conto è di tipo totale, esclusiva, quindi è più favorevole un collasso verso il basso, anche per l’entità Valuta ho preferito un collasso verso il basso, poiché favorevole il tipo di copertura. Mentre per l’entità Transazione fisica è favorevole si la copertura per un collasso verso il basso, siccome gli accessi principalmente non sono separati, come avviene principalmente con le entità precedentemente citate, ho optato per un collasso verso l’alto aggiungendo un identificatore sul tipo di entità che viene istanziata (o un prelievo o un deposito).

3.4.3 Scelta delle chiavi

Nello schema sono già evidenziate senza ambiguità tutte le chiavi primarie per la maggior  
parte delle entità, tranne per Exchange che è il nome stesso dell’Exchange

3.5 Analisi delle ridondanze

3.5.1 Ridondanza su Wallet

Andiamo ad indagare se effettivamente la ridondanza saldo in wallet velocizzi in media le operazioni, per wallet le operazioni coinvolte sono solo 4, 5

**Senza Ridondanza**

**OP. 4 Scambio tra valute**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Ordine | E | 1 | L |
| Transazione | E | 1 | S |
| Scambio | E | 1 | S |

***Totale: 1L + 2S = 5 accessi  
Frequenza: 5 \* 2 = 10 accessi al giorno***

**OP. 5 Report dei wallet**

Come calcolato in precedenza, i wallet medi per utente sono 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Wallet | E | 2 | L |
| Transazione | E | 11 | L |

***Totale: 13L = 13 accessi  
Frequenza: 13 \* 4 = 52 accessi al giorno***

**Frequenza totale delle operazioni coinvolte = 52 + 10 al giorno = 118 al giorno**

**Con Ridondanza**

**OP. 4 Effettuare uno scambio tra valute**

Caso in cui viene trovato un ordine speculare, effettuo lo scambio, eseguo la transazione, aggiornamento dei saldi dei due wallet.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Ordine | E | 1 | L |
| Transazione | E | 1 | S |
| Wallet | E | 2 | L |
| Wallet | E | 2 | S |
| Scambio | E | 1 | S |

***Totale: 3L + 4S = 11 accessi  
Frequenza: 2 \* 11 = 22 accessi al giorno***

**OP. 5 Report dei wallet**

Come calcolato in precedenza, i wallet medi per utente sono 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Wallet | E | 2 | L |

***Totale: 2L = 2 accessi  
Frequenza: 2 \* 4 = 8 accessi al giorno***

**Frequenza totale delle operazioni coinvolte = 8 + 22 al giorno = 30 al giorno**

Quindi la ridondanza del saldo sul wallet velocizza gli accessi in media

3.5.2 Ridondanza su Conti Correnti

Andiamo ad indagare se effettivamente la ridondanza saldo in conto corrente velocizzi in media le operazioni, per wallet le operazioni coinvolte sono 1, 2, 4, 5

**Senza Ridondanza**

**OP. 1 Deposito fondi su un conto corrente**

Per fare un deposito devo sapere quali commissioni ha l’ATM quindi faccio una lettura, poi aggiungo la somma depositata al conto corrente, sottratte le commissioni, poi aggiungo la somma di denaro all’ATM.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| ATM | E | 1 | L |
| Contante | R | 1 | L |
| Contante | R | 1 | S |
| Transazione Fisica | E | 1 | S |

***Totale: 2L + 2S = 6 accessi  
Frequenza: 6 \* 4 = 24 accessi a settimana***

**OP. 2 Prelievo fondi sul conto corrente**

Per fare un prelievo devo sapere quali commissioni ha l’ATM quindi faccio una lettura, poi sottraggo la somma prelevata al conto corrente, sottratte le commissioni, poi sottraggo la somma di denaro all’ATM.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| ATM | E | 1 | L |
| Contante | R | 1 | L |
| Contante | R | 1 | S |
| Transazione Fisica | E | 1 | S |

***Totale: 2L + 2S = 6 accessi  
Frequenza: 6 \* 4 = 24 accessi a settimana***

**OP. 4 Scambio tra valute**

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Ordine | E | 1 | L |
| Transazione | E | 1 | S |
| Scambio | E | 1 | S |

***Totale: 1L + 2S = 5 accessi  
Frequenza: 5 \* 2 = 10 accessi al giorno***

**OP. 5 Report dei conti correnti**

Come calcolato in precedenza, i conti correnti medi per utente sono 2.5

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Conto corrente | E | 2.5 | L |
| Transazione | E | 14 | L |

***Totale: 16.5L = 16.5 accessi  
Frequenza: 16.5 \* 4 = 66 accessi al giorno***

**Frequenza totale delle operazioni coinvolte = 24 + 24 + 70 + 462 a settimana = 580 a settimana**

**Con Ridondanza**

**OP. 1 Deposito fondi su un conto corrente**

Per fare un deposito devo sapere quali commissioni ha l’ATM quindi faccio una lettura, poi aggiungo la somma depositata al conto corrente, sottratte le commissioni, poi aggiungo la somma di denaro all’ATM.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| ATM | E | 1 | L |
| Conto Corrente | E | 1 | L |
| Conto Corrente | E | 1 | S |
| Contante | R | 1 | L |
| Contante | R | 1 | S |
| Transazione Fisica | E | 1 | S |

***Totale: 3L + 3S = 9 accessi  
Frequenza: 9 \* 4 = 36 accessi a settimana***

**OP. 2 Prelievo fondi sul conto corrente**

Per fare un prelievo devo sapere quali commissioni ha l’ATM quindi faccio una lettura, poi sottraggo la somma prelevata al conto corrente, sottratte le commissioni, poi sottraggo la somma di denaro all’ATM.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| ATM | E | 1 | L |
| Conto Corrente | E | 1 | L |
| Conto Corrente | E | 1 | S |
| Contante | R | 1 | L |
| Contante | R | 1 | S |
| Transazione Fisica | E | 1 | S |

***Totale: 3L + 3S = 9 accessi  
Frequenza: 9 \* 4 = 36 accessi a settimana***

**OP. 4 Effettuare uno scambio tra valute**

Caso in cui viene trovato un ordine speculare, effettuo lo scambio, eseguo la transazione, aggiornamento dei saldi dei due wallet.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Ordine | E | 1 | L |
| Transazione | E | 1 | S |
| Conto Corrente | E | 2 | L |
| Conto Corrente | E | 2 | S |
| Scambio | E | 1 | S |

***Totale: 3L + 4S = 11 accessi  
Frequenza: 2 \* 11 = 22 accessi al giorno***

**OP. 5 Report dei Conti Correnti**

Come calcolato in precedenza, i wallet medi per utente sono 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Concetto** | **Costrutto** | **Accessi** | **Tipo** |
| Conto Corrente | E | 2.5 | L |

***Totale: 2.5L = 2.5 accessi  
Frequenza: 2.5 \* 4 = 20 accessi al giorno***

**Frequenza totale delle operazioni coinvolte = 36 + 36 + 154 + 140 a settimana = 366 a settimana**

Quindi la ridondanza del saldo sul controcorrente velocizza gli accessi in media

3.6 Traduzione di entità e associazioni in relazioni

Utenti (ID, Nome, Cognome, Nazionalità, Residenza, Numero Telefono, Data Nascita, Codice Fiscale)

Registrati (Utente: Utenti, Nome: Exchange, Email, Password)

Exchange (Nome, Sede Operativa, Sede Legale, Sito Web, Fondatore)

Dipendenti (Matricola, Dirigente: Dipendenti, Utente: Utenti, Carica, Reparto, Salario)

Conti Correnti (Indirizzo, Utente: Utenti, Contiene: Fiat, Saldo)

Wallet (Indirizzo, Utente: Utenti, Contiene: Crypto, Saldo)

Transazioni (ID, Ticker: Valuta, Indirizzo Entrata: Conto, Indirizzo Uscita: Conto, Quantità, Data, Ora)

Scambi (Transazione Crypto: Transazioni, Transazione Fiat: Transazioni)

Valute (Ticker, Nome)

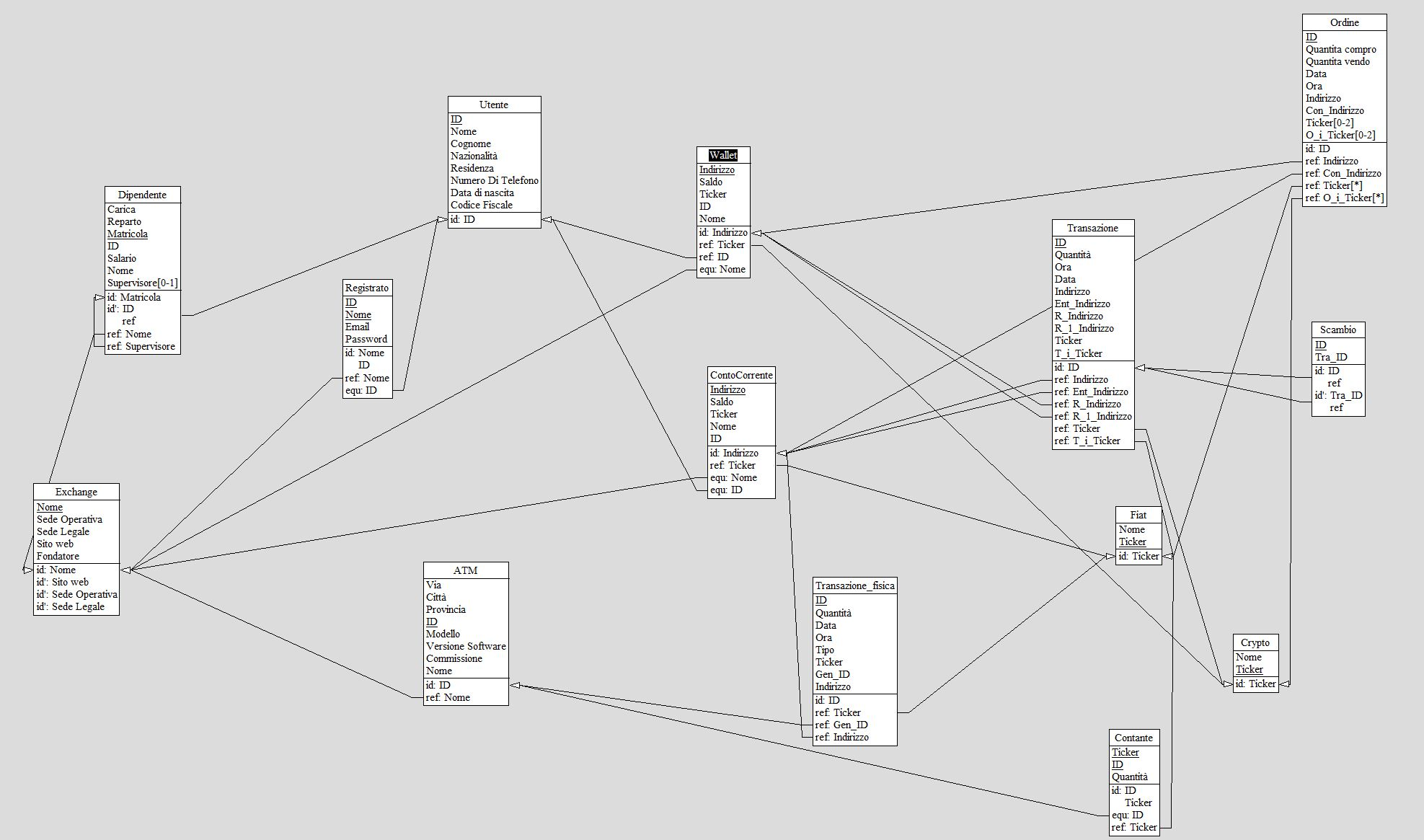
Ordini (ID, Indirizzo: Conto, Ticker Compro: Valuta, Ticker Vendo: Valuta, Quantità Compro, Quantità Vendo, Data, Ora)

ATM (ID, Via, Città, Provincia, Modello, Versione Software, Commissione)

Transazione Fisica (ID, Transazione Virtuale: Transazioni, Ticker: Fiat, Tipo, Quantità, Data, Ora)

Contante (ATM: ATM, Ticker: Fiat, Quantità)

3.7 Schema relazionale finale



3.8 Traduzione delle operazioni in query SQL

**OP. 1 Deposito fondi su un conto corrente**

Per fare una operazione sull’ATM devo prima sapere quali commissioni applica; quindi, ottengo tale valore.

SELECT Commissione FROM atm WHERE `Codice Identificativo`=?

Aggiorno il saldo del contocorrente (tenendo conto delle commissioni lette prima)

UPDATE contocorrente SET Saldo = Saldo + ? WHERE Indirizzo=?

Aggiorno la quantità disponibile di contante in tale atm

UPDATE contante SET Quantita = Quantita + ? WHERE `Codice ATM`=?

Registro la transazione effettuata.

INSERT INTO transazione\_fisica (`Ticker fiat`, Quantita, Conto, ATM, Tipo)  
VALUES ( ?, ?, ?, ?, 'Deposito')

**OP. 2 Prelievo fondi sul conto corrente**

Per fare una operazione sull’ATM devo prima sapere quali commissioni applica; quindi, ottengo tale valore.

SELECT Commissione FROM atm WHERE `Codice Identificativo`=?

Aggiorno il saldo del contocorrente (tenendo conto delle commissioni lette prima)

UPDATE contocorrente SET Saldo = Saldo - ? WHERE Indirizzo=?

Aggiorno la quantità disponibile di contante in tale atm

UPDATE contante SET Quantita = Quantita - ? WHERE `Codice ATM`=?

Registro la transazione effettuata.

INSERT INTO transazione\_fisica (`Ticker fiat`, Quantita, Conto, ATM, Tipo)  
VALUES ( ?, ?, ?, ?, ‘Prelievo’)

**OP. 3 Immagazzinamento di un ordine**

Prima di immagazzinare un nuovo ordine bisogna cercarne uno speculare

SELECT OrdineID, `Quantita compro` FROM Ordine  
WHERE `Ticker compro` = ? AND `Ticker vendo` = ? AND `Quantita compro` BETWEEN ? AND ?

Ora se la query precedente fallisce dovrò immagazzinare l’ordine fatto dall’utente

INSERT INTO Ordine (`Ticker compro`, `Ticker vendo`, `Quantita compro`, `Quantita vendo`, `Indirizzo compro`, `Indirizzo vendo`)  
VALUES ( ?, ?, ?, ?, ?, ? )

**OP. 4 Effettuare uno scambio tra valute**

Prima leggiamo l’ordine speculare

SELECT OrdineID, `Quantita compro` FROM Ordine  
WHERE `Ticker compro` = ? AND `Ticker vendo` = ? AND `Quantita compro` BETWEEN ? AND ?

Poi eseguiamo la transazione sul wallet degli utenti

INSERT INTO transazione (`Indirizzo Entrata`, `Indirizzo Uscita`, Ticker, Quantita)  
VALUES ( ?, ?, ?, ? )

Aggiorniamo i saldi sui wallet

UPDATE wallet SET Saldo = Saldo - ? WHERE Indirizzo = ?  
UPDATE wallet SET Saldo = Saldo + ? WHERE Indirizzo = ?

Poi eseguiamo la transazione sui conti degli utenti

INSERT INTO transazione (`Indirizzo Entrata`, `Indirizzo Uscita`, Ticker, Quantita)  
VALUES ( ?, ?, ?, ? )

Aggiorniamo i saldi sui conti

UPDATE contocorrente SET Saldo = Saldo - ? WHERE Indirizzo = ?  
UPDATE contocorrente SET Saldo = Saldo - ? WHERE Indirizzo = ?

Cancello l’ordine trovato all’inizio

DELETE FROM ordine WHERE OrdineID = ?

Registro le 2 transazioni come uno scambio

INSERT INTO scambio (`Transazione crypto`, `Transazione fiat`)  
VALUES ( ?, ? )

**OP. 5 Report conti di un utente**

Otteniamo tutti i conti posseduti da un utente in un dato Exchange

SELECT Indirizzo, Saldo, Ticker FROM wallet WHERE UserID = ? AND Nome = ?

SELECT Indirizzo, Saldo, Ticker FROM contocorrente WHERE UserID = ? AND Nome = ?

**OP. 6 Creazione wallet**

INSERT INTO wallet (UserID, Indirizzo, Saldo, Nome, Ticker)  
VALUES ( ?, ?, 0, ?, ?)

**OP. 7 Creazione Conto corrente**

INSERT INTO contocorrente (UserID, Indirizzo, Saldo, Nome, Ticker)  
VALUES ( ?, ?, ?, ?, ? )

**OP. 8 Aggiungere un Exchange**

INSERT INTO exchange (Nome, `Sede Operativa`, `Sede Legale`, `Sito web`, Fondatore)  
VALUES ( ?, ?, ?, ?, ? )

**OP. 9 Aggiungere una valuta fiat**

INSERT INTO fiat (Nome, Ticker) VALUES ( ?, ? )

**OP. 10 Registrazione ad un Exchange**

INSERT INTO registrati (ID, Email, Password, Exchange)  
VALUES ( ?, ?, ?, ? )

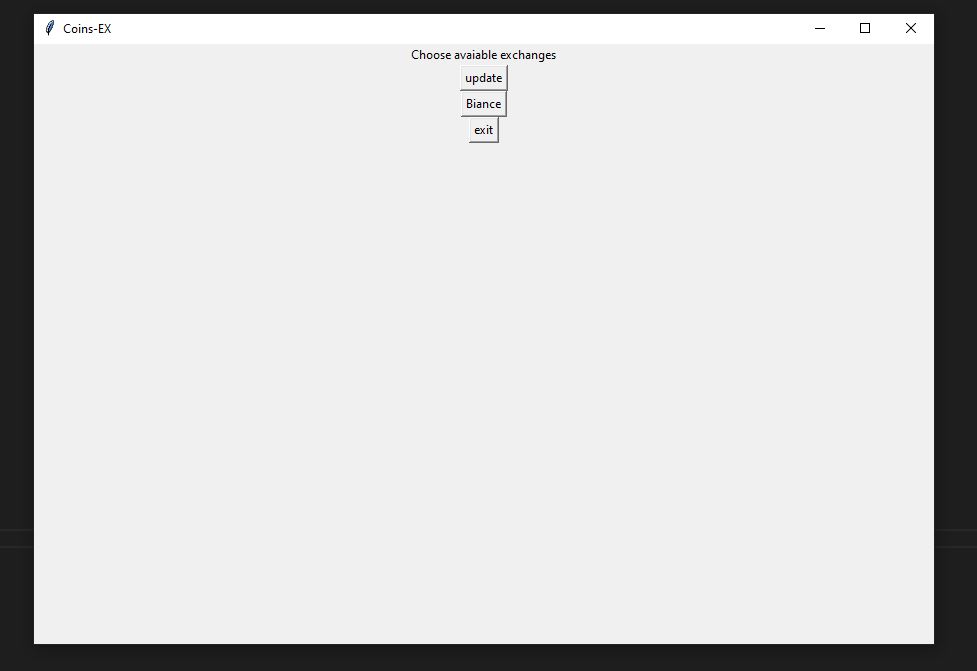
**OP. 11 Accesso ad un Exchange**

SELECT ID FROM registrati WHERE Email = ? AND Password = ? AND Exchange = ?

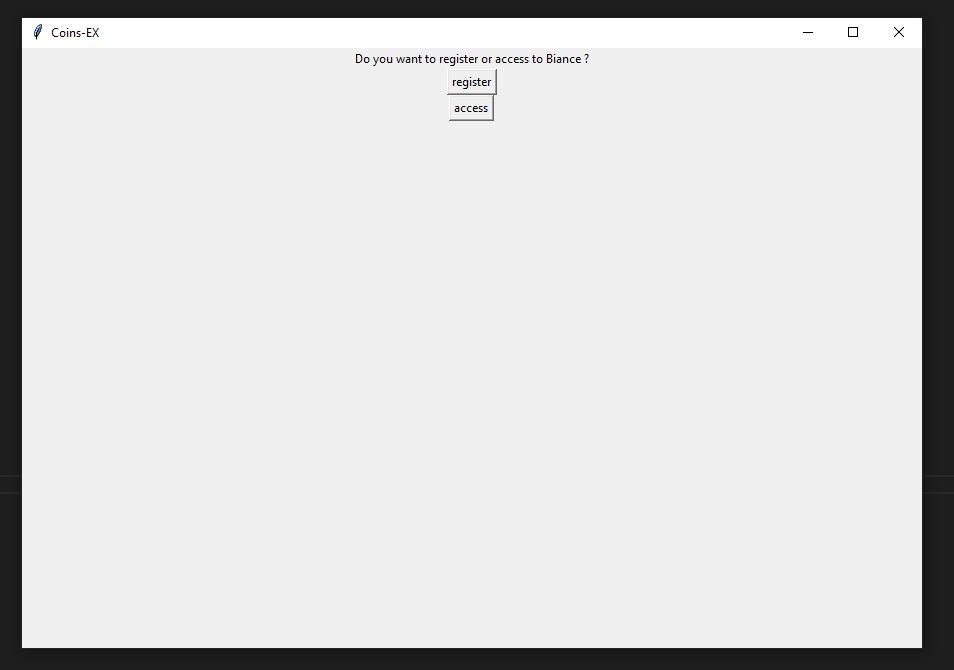
4 **Progettazione**

**L’applicazione è realizzata su Python, con database MySQL, ed è progettata seguendo il pattern architetturale MVC (Model-Control-View).**

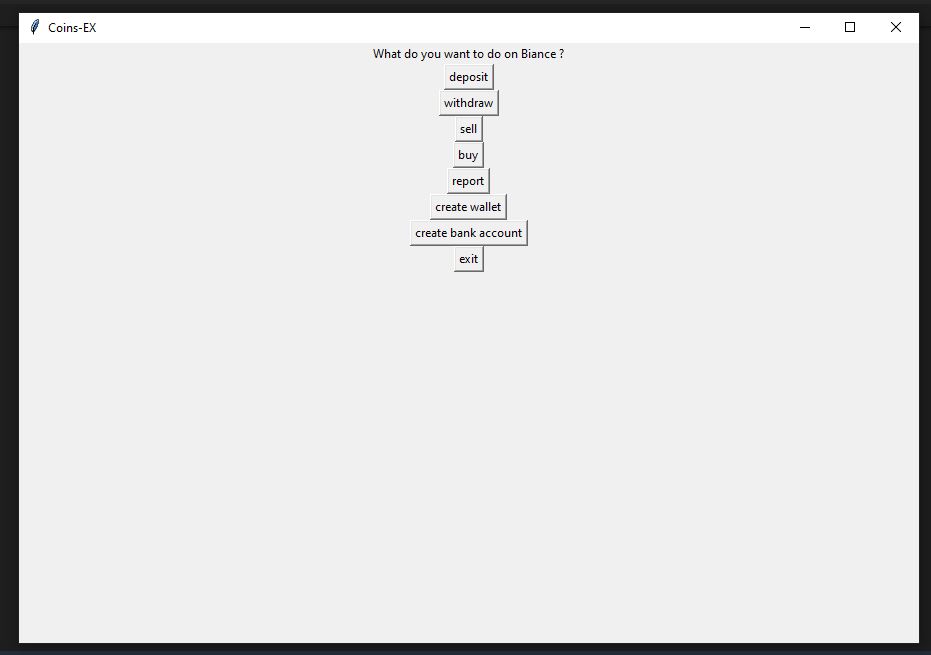
**Di seguito gli screen principali per l’uso dell’applicativo**

****

Qui è possibile scegliere tra gli Exchange esistenti quali si vuolo loggare, o registrare, in alternativa uscire o aggiornare la lista.



Una volta scelto l’Exchange, è possibile scegliere se registrarsi, o se già lo si è, accedervi.



Qua invece una volta entrati è possibile, eseguire le operazioni principali, poi una volta scelte l’utente sarà guidato nel completamento di tale operazione tramite input, testuale, o pulsanti.