TP 9 : Héritage sans polymorphisme

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7 Avril 2025

Objectif

- Créer un `Makefile` pour compiler tous les fichiers `.cpp`.
- Tous les fichiers doivent être regroupés dans un dossier `TP9_Nom_Prénom`.
- Aucun dépôt d'argent ne peut être effectué directement par les clients sur leurs propres comptes. Toutes les opérations de dépôt doivent impérativement passer par la classe Account.

Étapes à suivre

Étape 1 — Classe `Account`

- Attributs `static constexpr`, `private` :
  - `def_name` : nom par défaut (type `const char *`)
  - `def_balance` : solde par défaut (type `double`)
- Attributs d'instance (`protected`) :
  - `name` : nom du titulaire
  - `balance` : solde actuel
- Méthodes :
  - `Account(std::string name = def_name, double balance = def_balance);`
  - `bool deposit(double amount);`
    Dépose un montant s'il est positif.
  - `bool withdraw(double amount);`
    Retire un montant si le solde le permet.
  - `friend std::ostream& operator<<(...);`
    Affiche au format : `[Account: Nom: Solde]`

Étape 2 — Classe `Savings_Account`

- Hérite de : `Account`
- Attributs `static constexpr`, `private` :
  - `def_int_rate` : taux par défaut (type `double`)
- Attributs d'instance :
  - `int_rate` : taux d'intérêt appliqué aux dépôts
- Méthodes :
  - `Savings_Account(std::string name, double balance, double int_rate);`
  - `bool deposit(double amount);`
    Applique le taux d'intérêt sur le dépôt.
  - Hérite de `withdraw`.
  - `friend std::ostream& operator<<(...);`
    Affiche au format : `[Savings_Account: Nom: Solde, Taux]`

Étape 3 — Classe `Checking_Account`

- Hérite de : `Account`
- Attributs `static constexpr` :
  - `per_check_fee = 1.50` : frais fixes appliqués à chaque retrait
- Méthodes :
  - `Checking_Account(std::string name, double balance);`
  - `bool withdraw(double amount);`
    Applique les frais lors du retrait.
  - Hérite de `deposit`.
  - `friend std::ostream& operator<<(...);`
    Affiche au format : `[Checking_Account: Nom: Solde]`

Étape 4 — Classe `Trust_Account`

- Hérite de : `Savings_Account`
- Attributs `static constexpr`, `private` :
  - `bonus_amount = 50.0`
  - `bonus_threshold = 5000.0`
  - `max_withdrawals = 3`
  - `max_withdraw_percent = 0.2`
- Attribut d'instance :
  - `num_withdrawals` : compteur de retraits
- Méthodes :
  - `Trust_Account(std::string name, double balance, double int_rate);`
  - `bool deposit(double amount);`
    Ajoute un bonus si `amount` 5000.
  - `bool withdraw(double amount);`
    Limité à 3 retraits, chacun 20% du solde.
  - `friend std::ostream& operator<<(...);`

Affiche au format : `[Trust_Account: Nom: Solde, Taux, Retraits]`

Étape 5 — Fichier `Account_Util.h / .cpp`

- Créez les fonctions suivantes pour chaque type de compte :
  - `void display(const std::vector<T>& accounts);`
  - `void deposit(std::vector<T>& accounts, double amount);`
  - `void withdraw(std::vector<T>& accounts, double amount);`
- Où `T` est l'un des types suivants :
  - `Account`, `Savings_Account`, `Checking_Account`, `Trust_Account`
- Utilisez la surcharge de fonction (même nom, signatures différentes).

Étape 6 — Fichier `main.cpp`

```cpp
#include <iostream>
#include <vector>
#include "Account.h"
#include "Savings_Account.h"
#include "Checking_Account.h"
#include "Trust_Account.h"
#include "Account_Util.h"

int main() {
	std::cout.precision(2);
	std::cout << std::fixed;

	// Accounts
	std::vector<Account> accounts { Account{}, Account{"Larry"},
		Account{"Moe", 2000}, Account{"Curly", 5000} };
	display(accounts);
	deposit(accounts, 1000);
	withdraw(accounts, 2000);

	// Savings
	std::vector<Savings_Account> sav_accounts {
		Savings_Account{},
		Savings_Account{"Superman"},
		Savings_Account{"Batman", 2000},
		Savings_Account{"Wonderwoman", 5000, 5.0}
	};
	display(sav_accounts);
	deposit(sav_accounts, 1000);
	withdraw(sav_accounts, 2000);

	// Checking
	std::vector<Checking_Account> check_accounts {
		Checking_Account{},
		Checking_Account{"Kirk"},
		Checking_Account{"Spock", 2000},
		Checking_Account{"Bones", 5000}
	};
	display(check_accounts);
	deposit(check_accounts, 1000);
	withdraw(check_accounts, 2000);

	// Trust
	std::vector<Trust_Account> trust_accounts {
		Trust_Account{},
		Trust_Account{"Athos", 10000, 5.0},
		Trust_Account{"Porthos", 20000, 4.0},
		Trust_Account{"Aramis", 30000}
```

```
        };
        display(trust_accounts);
        deposit(trust_accounts, 1000);
        withdraw(trust_accounts, 3000);

        for (int i = 1; i <= 5; ++i)
        withdraw(trust_accounts, 1000);

        return 0;
}
```

Tests recommandés

- Retrait supérieur au solde.
- Dépôt négatif.
- Dépôt supérieur à 5000 dans un `Trust_Account`.
- Retrait $> 20\%$ dans un `Trust_Account`.
- Plus de 3 retraits sur un `Trust_Account`.
- Vérification des frais de retrait dans un `Checking_Account`.
- Affichage complet des comptes.

Output :

```
=== Accounts==========================================
[Account: Unnamed Account: 0.00]
[Account: Larry: 0.00]
[Account: Moe: 2000.00]
[Account: Curly: 5000.00]

=== Depositing to Accounts ==================================
Deposited 1000.00 to [Account: Unnamed Account: 1000.00]
Deposited 1000.00 to [Account: Larry: 1000.00]
Deposited 1000.00 to [Account: Moe: 3000.00]
Deposited 1000.00 to [Account: Curly: 6000.00]

=== Withdrawing from Accounts ===============================
Failed Withdrawal of 2000.00 from [Account: Unnamed Account: 1000.00]
Failed Withdrawal of 2000.00 from [Account: Larry: 1000.00]
Withdrew 2000.00 from [Account: Moe: 1000.00]
Withdrew 2000.00 from [Account: Curly: 4000.00]

=== Savings Accounts=================================
[Savings_Account: Unnamed Savings Account: 0.00, 0.00]
[Savings_Account: Superman: 0.00, 0.00]
[Savings_Account: Batman: 2000.00, 0.00]
[Savings_Account: Wonderwoman: 5000.00, 5.00]
```

```
=== Depositing to Savings Accounts==========================
Deposited 1000.00 to [Savings_Account: Unnamed Savings Account: 1000.00, 0.00]
Deposited 1000.00 to [Savings_Account: Superman: 1000.00, 0.00]
Deposited 1000.00 to [Savings_Account: Batman: 3000.00, 0.00]
Deposited 1000.00 to [Savings_Account: Wonderwoman: 6050.00, 5.00]

=== Withdrawing from Savings Accounts=======================
Failed Withdrawal of 2000.00 from [Savings_Account: Unnamed Savings Account:
1000.00, 0.00]
Failed Withdrawal of 2000.00 from [Savings_Account: Superman: 1000.00, 0.00]
Withdrew 2000.00 from [Savings_Account: Batman: 1000.00, 0.00]
Withdrew 2000.00 from [Savings_Account: Wonderwoman: 4050.00, 5.00]

=== Checking Accounts======================================
[Checking_Account: Unnamed Checking Account: 0.00]
[Checking_Account: Kirk: 0.00]
[Checking_Account: Spock: 2000.00]
[Checking_Account: Bones: 5000.00]

=== Depositing to Checking Accounts==========================
Deposited 1000.00 to [Checking_Account: Unnamed Checking Account: 1000.00]
Deposited 1000.00 to [Checking_Account: Kirk: 1000.00]
Deposited 1000.00 to [Checking_Account: Spock: 3000.00]
Deposited 1000.00 to [Checking_Account: Bones: 6000.00]

=== Withdrawing from Checking Accounts======================
Failed Withdrawal of 2000.00 from [Checking_Account: Unnamed Checking Account:
1000.00]
Failed Withdrawal of 2000.00 from [Checking_Account: Kirk: 1000.00]
Withdrew 2000.00 from [Checking_Account: Spock: 998.50]
Withdrew 2000.00 from [Checking_Account: Bones: 3998.50]

=== Trust Accounts=========================================
[Trust Account: Unnamed Trust Account: 0.00, 0.00%, withdrawals: 0]
[Trust Account: Athos: 10000.00, 5.00%, withdrawals: 0]
[Trust Account: Porthos: 20000.00, 4.00%, withdrawals: 0]
[Trust Account: Aramis: 30000.00, 0.00%, withdrawals: 0]

=== Depositing to Trust Accounts============================
Deposited 1000.00 to [Trust Account: Unnamed Trust Account: 1000.00, 0.00%,
withdrawals: 0]
Deposited 1000.00 to [Trust Account: Athos: 11050.00, 5.00%, withdrawals: 0]
Deposited 1000.00 to [Trust Account: Porthos: 21040.00, 4.00%, withdrawals: 0]
Deposited 1000.00 to [Trust Account: Aramis: 31000.00, 0.00%, withdrawals: 0]
```

```
=== Withdrawing from Trust Accounts=======================
Failed Withdrawal of 3000.00 from [Trust Account: Unnamed Trust Account: 1000.00,
0.00%, withdrawals: 0]
Failed Withdrawal of 3000.00 from [Trust Account: Athos: 11050.00, 5.00%,
withdrawals: 0]
Withdrew 3000.00 from [Trust Account: Porthos: 18040.00, 4.00%, withdrawals: 1]
Withdrew 3000.00 from [Trust Account: Aramis: 28000.00, 0.00%, withdrawals: 1]

=== Withdrawing from Trust Accounts=======================
Failed Withdrawal of 1000.00 from [Trust Account: Unnamed Trust Account: 1000.00,
0.00%, withdrawals: 0]
Withdrew 1000.00 from [Trust Account: Athos: 10050.00, 5.00%, withdrawals: 1]
Withdrew 1000.00 from [Trust Account: Porthos: 17040.00, 4.00%, withdrawals: 2]
Withdrew 1000.00 from [Trust Account: Aramis: 27000.00, 0.00%, withdrawals: 2]

=== Withdrawing from Trust Accounts=======================
Failed Withdrawal of 1000.00 from [Trust Account: Unnamed Trust Account: 1000.00,
 0.00%, withdrawals: 0]
Withdrew 1000.00 from [Trust Account: Athos: 9050.00, 5.00%, withdrawals: 2]
Withdrew 1000.00 from [Trust Account: Porthos: 16040.00, 4.00%, withdrawals: 3]
Withdrew 1000.00 from [Trust Account: Aramis: 26000.00, 0.00%, withdrawals: 3]

=== Withdrawing from Trust Accounts=======================
Failed Withdrawal of 1000.00 from [Trust Account: Unnamed Trust Account: 1000.00,
0.00%, withdrawals: 0]
Withdrew 1000.00 from [Trust Account: Athos: 8050.00, 5.00%, withdrawals: 3]
Failed Withdrawal of 1000.00 from [Trust Account: Porthos: 16040.00, 4.00%,
 withdrawals: 3]
Failed Withdrawal of 1000.00 from [Trust Account: Aramis: 26000.00, 0.00%,
withdrawals: 3]

=== Withdrawing from Trust Accounts=======================
Failed Withdrawal of 1000.00 from [Trust Account: Unnamed Trust Account: 1000.00,
0.00%, withdrawals: 0]
Failed Withdrawal of 1000.00 from [Trust Account: Athos: 8050.00, 5.00%,
withdrawals: 3]
Failed Withdrawal of 1000.00 from [Trust Account: Porthos: 16040.00, 4.00%,
withdrawals: 3]
Failed Withdrawal of 1000.00 from [Trust Account: Aramis: 26000.00, 0.00%,
 withdrawals: 3]

=== Withdrawing from Trust Accounts=======================
Failed Withdrawal of 1000.00 from [Trust Account: Unnamed Trust Account: 1000.00,
0.00%, withdrawals: 0]
```

```
Failed Withdrawal of 1000.00 from [Trust Account: Athos: 8050.00, 5.00%,
withdrawals: 3]
Failed Withdrawal of 1000.00 from [Trust Account: Porthos: 16040.00, 4.00%,
withdrawals: 3]
Failed Withdrawal of 1000.00 from [Trust Account: Aramis: 26000.00, 0.00%,
 withdrawals: 3]
```