

Car Customization Upgrade Implementation Plan

Feature ID: car-customization-upgrade

Date: 2025-12-08

Status: Planning Complete

Duration: 3 days (24 hours)

Overview

Kế hoạch triển khai 3 ngày cho hệ thống Car Customization Upgrade với 3 task chính:

1. **Day 1:** Upgrade code hệ thống customize (vehicle children support)
2. **Day 2:** Tạo hệ thống UI/control cho mobile
3. **Day 3:** Update hệ thống save/load và integration

Day 1: Core System Upgrade (8 hours)

Objective

Upgrade code hệ thống customize để có thể chọn và customize các xe khác nhau (dưới code nền)

Tasks

Task ID	Description	Time	Priority
D1-T1	Vehicle Type System & Blueprint Children	4h	Critical
D1-T2	Customization Subsystem Upgrade & Vehicle Factory	4h	Critical

Deliverables

- ECarVehicleType enum và data structures defined
- 4 Blueprint children classes created (Sedan, SUV, Sport, Electric)
- VehicleFactory spawns correct class
- Subsystem supports multi-vehicle garage
- Data Tables updated with vehicle type field

Task Details

D1-T1: Vehicle Type System & Blueprint Children (4h)

Scope:

- Tạo ECarVehicleType enum (Sedan, SUV, Sport, Electric)
- Tạo FCarConfigurationUpgrade, FVehicleGarageEntry structs
- Tạo 4 Blueprint children của BP_SimulatePhysicsCar
- Setup default stats và properties cho mỗi type

- Tạo DT_VehicleTypes Data Table
- BP_Sedan, BP_SUV, BP_Sport, BP_Electric

D1-T2: Customization Subsystem Upgrade & Vehicle Factory (4h)

Scope:

- Implement UVehicleFactory với SpawnVehicle()
- Upgrade UCarCustomizationSubsystem:
 - Vehicle type management
 - Garage system (multi-vehicle)
 - Type-specific part filtering
- Update DT_CarParts với CompatibleVehicleTypes
- Unit testing core logic

Output:

- VehicleFactory spawns đúng class theo type
- Subsystem quản lý được nhiều xe

Day 2: Mobile UI/Control System (8 hours)

Objective

Tạo hệ thống UI/control cho mobile với touch controls và vehicle selection

Tasks

Task ID	Description	Time	Priority
D2-T1	Mobile UI Framework & Touch Controls	4h	Critical
D2-T2	Vehicle Selector & Customization Panel	4h	Critical

Deliverables

- Mobile UI with touch gesture support
- Vehicle type selector functional
- Customization panel shows type-specific parts
- Preview updates for different vehicle types
- Responsive layout for different screen sizes

Task Details

D2-T1: Mobile UI Framework & Touch Controls (4h)

Scope:

- Create UMobileCustomizationUI base class
- Implement touch gesture handling cho mobile

- Preview widget với camera controls

Output:

- Touch controls responsive trên mobile
- Preview rotation/zoom hoạt động

D2-T2: Vehicle Selector & Customization Panel (4h)**Scope:**

- Create UVehicleSelectorWidget:
 - Display 4 vehicle types
 - Show stats comparison
 - Lock/unlock state
- Create UCustomizationPanelWidget:
 - Tab system (Parts, Colors, Styles)
 - Type-filtered content
 - Real-time preview updates
- UI polish và responsive layout

Output:

- Vehicle selector cho phép chọn type
- Customization panel filter theo type

Day 3: Save/Load & Integration (8 hours)

Objective

Update hệ thống save/load để khi load vào màn chơi có thể chọn đúng xe

Tasks

Task ID	Description	Time	Priority
D3-T1	Save/Load System Upgrade & Migration	4h	Critical
D3-T2	Race Integration & Testing	4h	Critical

Deliverables

- Save data includes vehicle type and selection
- Save data cũ migrates automatically
- Correct vehicle spawns in race
- All customizations applied correctly
- No regressions from previous version

Task Details

D3-T1: Save/Load System Upgrade & Migration (4h)

Scope:

- Upgrade UCarSaveGame structure để hỗ trợ multi-vehicle
- Implement migration từ save data cũ
- Update save/load functions
- Handle corrupt/missing data

Output:

- Save/Load hoạt động với vehicle type
- Migration từ save cũ tự động

D3-T2: Race Integration & Testing (4h)

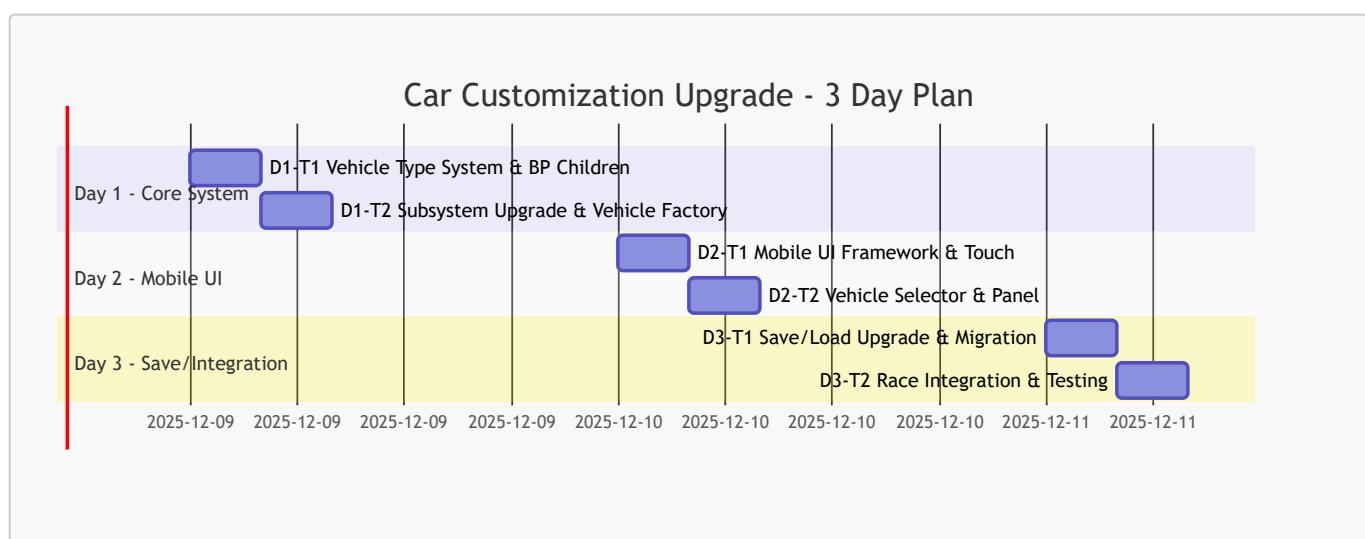
Scope:

- Integrate với ARaceTrackManager:
 - GetActiveVehicleConfiguration()
 - SpawnVehicle() với đúng type
 - Apply customization
- End-to-end testing:
 - All vehicle types spawn correctly
 - Customization persists
 - Migration works
 - Race integration works
- Bug fixes và polish

Output:

- Race spawn đúng xe đã chọn
- System hoạt động end-to-end

Task Dependencies



Task Summary

Day	Task	Time	Description
1	D1-T1	4h	Vehicle Type System & Blueprint Children
1	D1-T2	4h	Customization Subsystem Upgrade & Vehicle Factory
2	D2-T1	4h	Mobile UI Framework & Touch Controls
2	D2-T2	4h	Vehicle Selector & Customization Panel
3	D3-T1	4h	Save/Load System Upgrade & Migration
3	D3-T2	4h	Race Integration & Testing
Total	6 tasks	24h	3 days

Risk Assessment

Risk	Probability	Impact	Mitigation
BP children không inherit đúng	Low	High	Test early, use proper inheritance
Touch controls không responsive	Medium	Medium	Test on real devices early
Save migration fails	Medium	High	Backup old data, thorough testing
Race integration issues	Low	High	Clear interface contract