A group of people standing in a grassy area

AI-generated content may be incorrect.

**SuperLap Racing Line Optimization System**

**EPI-USE**

**Quintessential**

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## Testing Policy

#### Testing Scope & Levels

| **Level** | **Focus** | **Tools/Methods** | **Owners** |
| --- | --- | --- | --- |
| **Unit Testing** | Individual functions (e.g., track image processing, RL reward function). | Pytest (Python), JUnit (Java). | Developers |
| **Integration Testing** | Interaction between services (e.g., track processor → RL engine). | Postman, Jest (API tests), Selenium (UI flows). | QA Team |
| **System Testing** | End-to-end workflows (e.g., upload image → simulate → visualize). | Cypress, Robot Framework. | QA Team |
| **Performance Testing** | Scalability (e.g., 50 concurrent users), RL training speed. | Locust (load testing), NVIDIA Nsight (GPU profiling). | DevOps |
| **Security Testing** | Data encryption, auth vulnerabilities. | OWASP ZAP, SonarQube. | Security Team |
| **User Acceptance (UAT)** | Real-world usability (by target users). | Beta releases, A/B testing. | Product Team |

#### Testing Types & Frequency

| **Test Type** | **Description** | **Frequency** |
| --- | --- | --- |
| **Automated Regression** | Validate existing features after updates. | On every Git commit (CI/CD). |
| **Manual Exploratory** | Unscripted UX/edge-case testing. | Before major releases. |
| **Physics Validation** | Compare AI racing lines against known heuristics (e.g., apex accuracy). | Per RL model update. |
| **Hardware Compatibility** | GPU/CPU performance benchmarks. | Quarterly. |

#### Entry & Exit Criteria

**Entry Criteria (Tests Start When):**

* Requirements are documented (e.g., FR/NFRs).
* Code is merged to the test branch.
* Test environment mirrors production (GPU-enabled).

**Exit Criteria (Tests Pass When):**

* **Unit/Integration:** ≥90% code coverage (measured via Coveralls).
* **Performance:** <2s response time for track processing; RL training FPS ≥30.
* **Security:** Zero critical OWASP vulnerabilities.
* **UAT:** ≥80% positive feedback from beta testers.

#### Defect Management

* **Severity Levels:**
  + **Critical** (Crash/data loss): Fixed within 24h.
  + **Major** (Feature failure): Fixed in next sprint.
  + **Minor** (UI glitch): Backlogged for prioritization.
* **Tracking:** Jira/Linear with labels (bug, reproducible, blocker).

#### Environments

| **Environment** | **Purpose** | **Access** |
| --- | --- | --- |
| **Development** | Feature development. | Engineers only. |
| **Staging** | Pre-production (mirrors prod). | QA/Product Team. |
| **Production** | Live user-facing system. | Automated deployments only. |

#### Test Data Management

* **Realistic Datasets:**
  + 10+ sample tracks (F1, MotoGP circuits).
  + Synthetic data from racing sims (Assetto Corsa).
* **Anonymization:** User-uploaded tracks scrubbed of metadata.

#### Compliance & Reporting

* **Audits:** Monthly test coverage/review meetings.
* **Reports:** Dashboards (Grafana) for:
  + Test pass/fail rates.
  + Performance trends (e.g., lap time prediction accuracy).

#### Policy Exceptions

* **Emergency Fixes:** Hotfixes may bypass some tests but require:
  + Post-deployment regression testing.
  + Retrospective review.