

Tournament Management System

A universal platform for creating and tracking various types of tournaments, such as e-sports and board games

Stage 1: Initial System Specification

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1. Introduction

1.1. Project objective

The objective of the project is to design and implement a universal tournament management platform (hereinafter: the “System”). The System will enable creation of tournaments for various disciplines (e.g., e-sports, board games, amateur competitions), automatic generation of brackets according to a selected tournament system, registration of participants (individuals and teams), input and presentation of results, and storage of historical data.

The System is intended primarily to facilitate the work of organizers and referees and to provide spectators and participants with a clear and reliable source of information about match progress and outcomes.

1.2. Project scope

In-scope functionalities:

- User registration and login.
- Tournament creation with choice of game template and tournament system (Single Elimination, Double Elimination, Round Robin, Swiss, Table-based).
- Configuration of visibility (public/private), registration rules (open / registered-only), participant limits, and local moderators.
- Participant registration (individuals and teams), CSV import of participants.
- Automatic bracket / pairing generation according to the selected tournament system.
- Result entry by authorized users (organizer/moderator) — both as events (e.g., goals, rounds) and as final match results.
- Display of brackets, match results, rankings and tournament history (archive).
- Basic REST API for integration and automation (high-level mention only, no endpoint specification).
- Audit logging (recording result changes and the user who performed them).

In-scope functionalities:

- Video streaming and integration with streaming platforms.
- Advanced real-time mechanisms (WebSockets) beyond optional live features.
- Payments and entry fee systems.
- Advanced statistical analysis / machine learning features.

1.3. Stakeholders

- **Tournament organizers** — create tournaments, configure settings, add moderators.
- **Moderators / Referees** — input and approve results.
- **Participants (players / teams)** — take part in tournaments and review their matches.
- **Spectators / Audience** — view public tournaments and results.

1.4. Benefits of deployment

- Reduced tournament setup time through automatic pairing generation.
- Centralized and standardized presentation and archival of results.
- Reduced human error thanks to controlled result entry by authorized roles.
- Reuse of tournament configurations via templates.
- Potential for future extension with real-time features and integrations.

2. Domain analysis

2.1. Review of existing solutions

The comparative analysis covers popular market solutions, their key features, strengths and limitations.

a) Challengo

- **Strengths:** simple interface for creating tournaments, many bracket types, integration API.
- **Weaknesses:** limited ability to customize advanced scoring rules and multi-player table handling; advanced features may be paid.
- **Positioning:** suitable for quick, simple 1v1 competitions.

b) Toornament

- **Strengths:** extensive e-sports support, advanced tournament options and integrations.
- **Weaknesses:** relatively complex interface; configuration may require significant time.
- **Positioning:** platform for large, complex e-sports events.

c) Battlefy

- **Strengths:** broad configuration options, e-sports focus, team management features.
- **Weaknesses:** limited flexibility for unusual board-game formats.
- **Positioning:** targeted at league-style e-sports competitions.

d) Tournament Software (sport solutions)

- **Strengths:** solid reporting tailored to traditional sports.
- **Weaknesses:** often desktop or closed systems, less web-friendly for integrations.
- **Positioning:** used by sports organizations and associations.

2.2. Conclusion from the analysis

The proposed System aims to combine the ease of use of Challonge with the configuration flexibility of Toornament, while specifically targeting board games and multi-player table formats — a niche often underserved by existing services. Emphasis on a clear API and easily assignable scoring rules (game templates) will be an advantage for integrations and reusability.

3. System description and vision

3.1. High-level product description

The System will be a web application, with a dedicated administrative panel for organizers and moderators and a public view for spectators. A versioned API will be available for automation and external integrations (e.g., importing participants). Bracket and ranking visualizations will be responsive and adapted to various screen sizes.

Key capabilities:

- Responsive UI (works on desktop and mobile).
- Security and privacy by design (see non-functional requirements).
- Tournament creator can select a scoring type (predefined rules or a custom rule).
- Tournament may have a visual theme.
- An upcoming tournaments list shall be available with the ability to register (subject to the registration settings).
- Tournament history (archive) must be accessible.
- Optional live results (live feature is optional for MVP).
- Readable visualizations: responsive tables/leaderboards and brackets.
- Any logged-in user may create a tournament.
- The owner (organizer) may add moderators to manage the tournament (moderators enter results).
- Some tournaments may require registration or organizer approval.
- The registration system must be refined: support for registration modes (open, registered-only, requires approval), limits, and waitlists.

3.2. Actors (roles)

- **Organizer** — creates and configures the tournament, assigns moderators, opens/closes registration.
- **Moderator / Referee** — inputs match results, can revert incorrect entries, has editing rights in assigned tournaments.
- **Participant (Player / Team)** — registers for tournaments and views own matches and schedules.
- **Viewer (Guest)** — views public tournaments and results without editing rights.

4. System requirements

4.1. Functional requirements (RF)

RF-01 — User registration and login

- The System shall allow user registration using email and password, and allow users to log in.
- **Acceptance criterion:** a new user can create an account and log in. Passwords must satisfy the policy: at least 8 characters, including at least one digit and one uppercase letter.

RF-02 — Any logged-in user may create a tournament

- Any logged-in user can create a new tournament.
- **Acceptance criterion:** after creation, the user becomes the owner and has configuration privileges.

RF-03 — Game templates and scoring selection

- The organizer selects a game template (scoring rule) prior to creating the tournament. The System supports a set of predefined rules and the ability to upload a custom rule.
- **Acceptance criterion:** for a given scoring rule, the System computes rankings consistently and repeatably for the same set of results.

RF-04 — Tournament registration

- The System supports registration modes: public (anyone may sign up), registered-only, or approval required (organizer approves submissions). Additionally: participant limits and a waitlist.
- **Acceptance criterion:** registrations preserve order; registrations beyond the limit are rejected; in approval mode submissions have a pending status until accepted.

RF-05 — Upcoming tournaments and sign-ups

- The System provides a view of upcoming tournaments with the ability to sign up, subject to the registration mode.
- **Acceptance criterion:** a user sees upcoming tournaments and can register provided they meet the registration requirements.

RF-06 — Private tournaments

- The organizer may mark a tournament as private. Pairings and results are then visible only to participants and assigned moderators/organizer.
- **Acceptance criterion:** only participants and authorized staff can view private tournament details.

RF-07 — Moderators and delegated management

- The organizer may add moderators authorized to enter and edit results for the tournament. Moderators cannot change global tournament settings (owner retains ownership).
- **Acceptance criterion:** only assigned moderators have editing access to results.

RF-08 — Bracket generation and visualization

- The System generates brackets/pairings according to the selected tournament system. Bracket and ranking visualizations must be clear and responsive.
- **Acceptance criterion:** generated bracket includes all active participants and correctly maps advancement between rounds; visualizations render correctly on desktop and mobile devices.

RF-09 — Result and event entry

- Moderators/organizers enter results and events (optional live-event support). The System stores change history and supports undo.
- **Acceptance criterion:** each change is recorded with author and timestamp; undo restores the previous state.

RF-10 — Tournament history and archive

- The System stores finished tournaments in an archive. Users can browse their tournament history and results.
- **Acceptance criterion:** finished tournaments are accessible in a “History” section with complete results and metadata.

RF-11 — Tournament visual theme

- The organizer may assign a visual theme to a tournament consisting of a banner/header graphic, a color palette (primary and accent colors), and an optional logo. The theme affects the tournament pages' appearance (headers, panel backgrounds, buttons, accents) but must not impair content readability.
- **Acceptance criterion:** after applying the theme it is visible in the tournament preview and used across tournament pages (match list, bracket, ranking). The system accepts graphics in specified formats and sizes; uploads violating limits are rejected with a validation message. A "Restore default theme" button is available.

RF-12 — Import / Export of participants and results

- The System allows importing participant lists (CSV) and exporting results/classifications to common formats (CSV/JSON).
- **Acceptance criterion:** import reports validation errors; export produces correct, parseable files.

4.2. Non-functional requirements (RNF)

RNF-01 — Responsiveness

- The UI shall be responsive.
- **Acceptance criterion:** key screens (tournament creation, upcoming list, match view, bracket) render correctly on desktop and common mobile widths.

RNF-02 — Security

- The System shall enforce authentication and authorization mechanisms and store data securely.
- **Acceptance criterion:** no critical vulnerabilities found in a security audit prior to deployment.

RNF-03 — Performance

- The System shall handle at least 1000 concurrent active users.
- **Acceptance criterion:** 95% of read requests have latency < 200 ms in a test environment reflecting expected load.

RNF-04 — Media & theme handling

- The System must correctly handle upload, storage and presentation of theme assets (banner, logo, color palette).
- **Acceptance criterion:** supported formats: JPEG, PNG, WebP; max banner size 5 MB, logo 2 MB; system performs automatic image optimization and generates responsive variants (e.g., 1×, 2×) in < 2 s for an input file at the maximum allowed size in a typical test environment.

RNF-05 — Privacy and GDPR

- The System must allow deletion of a user's personal data upon request.
- **Acceptance criterion:** deletion procedure completed within 24 hours of request.

RNF-06 — Usability

- An organizer shall be able to configure a basic tournament in under 10 minutes without additional instructions.
- **Acceptance criterion:** usability test with 5 users yields a task completion rate $\geq 80\%$.

5. Glossary

Audit — a historical record of critical system operations, in particular result changes, including user ID and timestamp.

Bracket — structure showing pairings and participant advancement in elimination systems.

Game Template — a predefined set of parameters for a specific game (players per match, scoring type, allowed modes), used when creating tournaments.

Match — a single contest between participants within a tournament; has status, result and events.

Moderator / Referee — a user authorized to enter/edit results in assigned tournaments.

Organizer — a user who creates a tournament and defines its parameters and moderators.

Participant — an individual or team taking part in a tournament.

Private tournament — a tournament visible only to participants and assigned moderators.

Ranking / Standing — ordered list of participants based on points and tie-breakers.

Round Robin — a system in which each participant plays every other participant at least once.

Scoring Rule — a set of rules defining how many points are awarded for given match outcomes (e.g., 3/1/0 in football).

Swiss System — a tournament format where players are paired by current results to match opponents with similar performance.

Tournament System — the algorithm/rules for pairings and advancement (e.g., single elimination, double elimination, swiss, round robin).

User — any person with an account in the System; a user has a role that determines permissions.