# miniCycle - Developer Documentation

\*\*Version\*\*: 1.275

\*\*Target Audience\*\*: Developers, Contributors, Technical Partners

\*\*Purpose\*\*: Comprehensive technical guide for development and integration

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## Executive Summary

miniCycle is a production-ready web application that introduces a revolutionary “cycling” approach to task management. Built with vanilla JavaScript and modern web standards, it offers automatic task reset functionality that promotes habit formation and routine establishment.

\*\*Key Technical Highlights:\*\*

- \*\*Zero Dependencies\*\*: Pure JavaScript implementation with no external libraries

- \*\*Privacy-First Architecture\*\*: 100% client-side storage with no data transmission

- \*\*Advanced Recurring System\*\*: Comprehensive scheduling rivaling enterprise solutions

- \*\*PWA Implementation\*\*: Offline-capable with service worker and manifest

- \*\*Dual Version Strategy\*\*: Modern ES6+ and ES5 fallback for maximum compatibility

- \*\*Modular Design\*\*: Clean architecture enabling easy extension and customization

\*\*Business Value:\*\*

- \*\*Rapid Deployment\*\*: Static files only - no server infrastructure required

- \*\*Scalable Foundation\*\*: Architecture supports feature expansion for paid versions

- \*\*Cross-Platform\*\*: Single codebase works across all devices and browsers

- \*\*Maintenance Efficient\*\*: Self-contained codebase with comprehensive documentation

\*\*Technical Sophistication:\*\*

- Schema versioning with automatic data migration

- Advanced drag-and-drop with touch and mouse support

- Comprehensive theming system with unlockable rewards

- Professional error handling and recovery procedures

- Enterprise-grade notification and modal systems

This documentation provides everything needed to understand, extend, or integrate with miniCycle’s robust technical foundation.

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## Overview

miniCycle is a sophisticated web-based task management application that revolutionizes productivity through automatic task cycling. Unlike traditional task managers, miniCycle resets completed task lists to promote habit formation and routine establishment.

### Core Philosophy

- \*\*Privacy-First\*\*: All data stored locally, no external servers

- \*\*Offline-Capable\*\*: Full functionality without internet connection

- \*\*Habit-Focused\*\*: Cycling methodology encourages consistent routines

- \*\*Cross-Platform\*\*: Responsive design works on all devices

### Key Differentiators

- Automatic task reset system

- Advanced recurring task scheduling

- Multiple cycle management

- Unlockable theme system with gamification

- Comprehensive PWA implementation

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## Architecture

### Technology Stack

```

Frontend Layer:

├── HTML5 (Semantic structure)

├── CSS3 (Custom properties, Grid, Flexbox)

├── Vanilla JavaScript (ES6+ with ES5 fallback)

└── Progressive Web App (Service Worker, Manifest)

Data Layer:

├── localStorage (Primary storage)

├── JSON schema (Version 2.5)

├── Migration system (Backwards compatibility)

└── Export/Import (.mcyc files)

Compatibility Layer:

├── Modern browsers (Chrome, Firefox, Safari, Edge)

├── ES5 fallback (miniCycle-lite.html)

├── Touch and mouse events

└── Responsive breakpoints

```

### Project Structure

```

miniCycle/

├── Core Application

│ ├── miniCycle.html # Main application entry

│ ├── miniCycle-scripts.js # Core logic (ES6+)

│ ├── miniCycle-styles.css # Main stylesheet

│ └── manifest.json # PWA configuration

│

├── Compatibility Version

│ ├── miniCycle-lite.html # ES5 compatible entry

│ ├── miniCycle-lite-scripts.js # ES5 compatible logic

│ ├── miniCycle-lite-styles.css # Optimized styles

│ └── manifest-lite.json # Lite PWA config

│

├── Documentation

│ ├── user-manual.html # End user guide

│ ├── user-manual-styles.css # Manual styling

│ ├── privacy.html # Privacy policy

│ └── terms.html # Terms of service

│

└── Assets

├── icons/ # PWA icons (various sizes)

└── images/ # App screenshots, logos

```

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## Core Systems

### 1. Task Management System

#### Task Creation and Validation

```javascript

function addTask(taskText, completed = false, shouldSave = true,

dueDate = null, highPriority = null, isLoading = false,

remindersEnabled = false, recurring = false,

taskId = null, recurringSettings = {}) {

// Input validation and sanitization

const sanitizedText = sanitizeInput(taskText);

if (!sanitizedText) {

showNotification("Task text cannot be empty", "error");

return false;

}

// Generate unique task ID

const id = taskId || generateUniqueId();

// Create task object with schema version

const task = {

id: id,

text: sanitizedText,

completed: completed,

priority: highPriority || false,

dueDate: dueDate,

remindersEnabled: remindersEnabled,

recurring: recurring,

recurringSettings: recurringSettings,

schemaVersion: SCHEMA\_VERSION,

createdAt: new Date().toISOString(),

completedAt: null

};

// Add to task list and update UI

taskList.push(task);

if (shouldSave) autoSave();

return task;

}

```

#### Task State Management

```javascript

function handleTaskCompletionChange(checkbox) {

const taskElement = checkbox.closest('.task');

const taskId = taskElement.dataset.taskId;

const task = findTaskById(taskId);

if (!task) return;

// Save state for undo functionality

saveUndoState('task\_completion');

// Update task state

task.completed = checkbox.checked;

task.completedAt = checkbox.checked ? new Date().toISOString() : null;

// Visual feedback

taskElement.classList.toggle('completed', checkbox.checked);

// Check for cycle completion

if (allTasksCompleted() && getCurrentCycle().autoReset) {

triggerCycleCompletion();

}

autoSave();

updateProgress();

}

```

### 2. Cycle Management System

#### Cycle Types and Behavior

```javascript

const CycleTypes = {

AUTO\_RESET: {

behavior: 'auto\_reset',

resetDelay: 3000, // 3 seconds

deleteCompleted: false,

showCompleteButton: false

},

MANUAL\_RESET: {

behavior: 'manual\_reset',

resetDelay: null,

deleteCompleted: false,

showCompleteButton: true

},

TODO\_LIST: {

behavior: 'delete\_completed',

resetDelay: null,

deleteCompleted: true,

showCompleteButton: false

}

};

```

#### Cycle Operations

```javascript

function createNewMiniCycle(name, autoReset = true, deleteChecked = false) {

// Validate cycle name

if (miniCycleStorage[name]) {

showNotification("A cycle with that name already exists", "error");

return false;

}

// Create new cycle structure

const newCycle = {

title: name,

tasks: [],

recurringTemplates: {},

autoReset: autoReset,

deleteCheckedTasks: deleteChecked,

cycleCount: 0,

createdAt: new Date().toISOString(),

lastModified: new Date().toISOString()

};

// Save to storage

miniCycleStorage[name] = newCycle;

localStorage.setItem('miniCycleStorage', JSON.stringify(miniCycleStorage));

showNotification(`Created new cycle: ${name}`, "success");

return true;

}

function switchToMiniCycle(cycleName) {

if (!miniCycleStorage[cycleName]) {

showNotification("Cycle not found", "error");

return false;

}

// Save current state

autoSave();

// Switch active cycle

localStorage.setItem('activeMiniCycle', cycleName);

// Load new cycle

loadMiniCycle();

showNotification(`Switched to: ${cycleName}`, "info");

return true;

}

```

### 3. Recurring Tasks System

#### Recurring Settings Schema

```javascript

const RecurringSettings = {

frequency: "hourly|daily|weekly|monthly|yearly",

indefinitely: true, // or false with count

count: null, // number of occurrences if not indefinite

// Time settings

time: {

hour: 9, // 1-12 or 0-23

minute: 0, // 0-59

meridiem: "AM", // "AM" or "PM"

military: false // 24-hour format

},

// Weekly settings

weekly: {

days: ["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"]

},

// Monthly settings

monthly: {

days: [1, 15, 30] // Days of month

},

// Yearly settings

yearly: {

months: [1, 6, 12], // January, June, December

daysByMonth: {

1: [1], // January 1st

6: [15], // June 15th

12: [25] // December 25th

}

},

// Specific dates override

specificDates: {

enabled: false,

dates: ["2025-12-25", "2025-07-04"]

}

};

```

#### Recurring Task Logic

```javascript

function shouldTaskRecurNow(settings, now = new Date()) {

const { frequency, time, indefinitely, count } = settings;

// Check if task has exceeded occurrence limit

if (!indefinitely && settings.occurrenceCount >= count) {

return false;

}

// Parse target time

const targetTime = parseTimeSettings(time);

const currentTime = {

hour: now.getHours(),

minute: now.getMinutes()

};

// Check if current time matches target time

if (!timeMatches(currentTime, targetTime)) {

return false;

}

// Frequency-specific checks

switch (frequency) {

case 'hourly':

return currentTime.minute === targetTime.minute;

case 'daily':

return true; // Time already checked above

case 'weekly':

const dayName = ['Sun', 'Mon', 'Tue', 'Wed', 'Thu', 'Fri', 'Sat'][now.getDay()];

return settings.weekly.days.includes(dayName);

case 'monthly':

const dayOfMonth = now.getDate();

return settings.monthly.days.includes(dayOfMonth);

case 'yearly':

const month = now.getMonth() + 1; // 0-based to 1-based

const day = now.getDate();

return settings.yearly.months.includes(month) &&

settings.yearly.daysByMonth[month]?.includes(day);

default:

return false;

}

}

// Background monitoring system

function watchRecurringTasks() {

const now = new Date();

const activeCycle = getCurrentCycle();

Object.entries(activeCycle.recurringTemplates).forEach(([taskId, template]) => {

if (shouldTaskRecurNow(template.recurringSettings, now)) {

// Check if task already exists (prevent duplicates)

const existingTask = findTaskById(taskId);

if (!existingTask || existingTask.completed) {

recreateRecurringTask(template);

}

}

});

}

// Run every 30 seconds

setInterval(watchRecurringTasks, 30000);

```

-----

## API Reference

### Core Task Functions

#### `addTask(options)`

Creates a new task with comprehensive options.

```javascript

// Basic usage

addTask("Complete project documentation");

// Advanced usage with all options

addTask("Daily standup meeting", false, true, "2025-09-16T09:00:00Z", true, false, true, true, null, {

frequency: "daily",

indefinitely: true,

time: { hour: 9, minute: 0, meridiem: "AM" }

});

```

#### `editTask(taskId, newText, options)`

Modifies existing task properties.

```javascript

editTask("task-123", "Updated task description", {

priority: true,

dueDate: "2025-09-20T17:00:00Z"

});

```

#### `deleteTask(taskId)`

Removes task and cleans up related data.

```javascript

deleteTask("task-123");

// Automatically saves state for undo and updates UI

```

### Cycle Management Functions

#### `createNewMiniCycle(name, type)`

Creates a new task cycle with specified behavior.

```javascript

// Auto-reset cycle

createNewMiniCycle("Morning Routine", true, false);

// Manual reset cycle

createNewMiniCycle("Project Tasks", false, false);

// To-do list mode

createNewMiniCycle("Shopping List", false, true);

```

#### `exportMiniCycle(cycleName)`

Exports cycle as downloadable .mcyc file.

```javascript

exportMiniCycle("Morning Routine");

// Downloads: morning-routine.mcyc

```

### Storage Functions

#### `autoSave(overrideTaskList)`

Saves current application state to localStorage.

```javascript

// Save current state

autoSave();

// Save specific task list

autoSave(customTaskList);

```

#### `loadMiniCycle(cycleName)`

Loads specified cycle or active cycle from storage.

```javascript

loadMiniCycle(); // Load active cycle

loadMiniCycle("Work Tasks"); // Load specific cycle

```

-----

## Data Management

### Schema Evolution System

#### Current Schema (Version 2.5)

```javascript

const SCHEMA\_VERSION = 2.5;

// Task schema

const TaskSchema = {

id: "string", // Unique identifier

text: "string", // Task description (max 50 chars)

completed: "boolean", // Completion state

priority: "boolean", // High priority flag

dueDate: "string|null", // ISO 8601 date string

remindersEnabled: "boolean",

recurring: "boolean",

recurringSettings: "object",

schemaVersion: "number",

createdAt: "string", // ISO 8601 timestamp

completedAt: "string|null"

};

// Cycle schema

const CycleSchema = {

title: "string",

tasks: "array",

recurringTemplates: "object",

autoReset: "boolean",

deleteCheckedTasks: "boolean",

cycleCount: "number",

createdAt: "string",

lastModified: "string"

};

```

#### Migration System

```javascript

function migrateTask(task) {

let migrated = { ...task };

// Migrate from schema 1.0 to 2.0

if (!task.schemaVersion || task.schemaVersion < 2.0) {

migrated.priority = false;

migrated.dueDate = null;

migrated.remindersEnabled = false;

migrated.schemaVersion = 2.0;

}

// Migrate from schema 2.0 to 2.5

if (migrated.schemaVersion < 2.5) {

migrated.recurring = false;

migrated.recurringSettings = {};

migrated.createdAt = migrated.createdAt || new Date().toISOString();

migrated.completedAt = null;

migrated.schemaVersion = 2.5;

}

return migrated;

}

```

### Storage Structure

```javascript

// localStorage keys and structure

const StorageKeys = {

MINI\_CYCLE\_STORAGE: 'miniCycleStorage',

ACTIVE\_MINI\_CYCLE: 'activeMiniCycle',

REMINDERS\_SETTINGS: 'remindersSettings',

THEME\_SETTINGS: 'selectedTheme',

APP\_SETTINGS: 'appSettings'

};

// Example storage content

const ExampleStorage = {

miniCycleStorage: {

"Morning Routine": {

title: "Morning Routine",

tasks: [

{

id: "task-001",

text: "Drink water",

completed: false,

priority: false,

dueDate: null,

remindersEnabled: false,

recurring: true,

recurringSettings: {

frequency: "daily",

indefinitely: true,

time: { hour: 7, minute: 0, meridiem: "AM" }

},

schemaVersion: 2.5,

createdAt: "2025-09-16T06:00:00Z",

completedAt: null

}

],

recurringTemplates: {},

autoReset: true,

deleteCheckedTasks: false,

cycleCount: 12,

createdAt: "2025-09-01T06:00:00Z",

lastModified: "2025-09-16T06:00:00Z"

}

},

activeMiniCycle: "Morning Routine",

remindersSettings: {

enabled: true,

indefinite: false,

dueDatesReminders: true,

repeatCount: 3,

frequencyValue: 30,

frequencyUnit: "minutes"

}

};

```

-----

## UI Components

### Modal System

#### Settings Modal

```javascript

function setupSettingsModal() {

const settingsModal = document.getElementById('settingsModal');

// Dark mode toggle

const darkModeToggle = document.getElementById('darkModeToggle');

darkModeToggle.addEventListener('change', (e) => {

toggleDarkMode(e.target.checked);

});

// Move arrows toggle

const moveArrowsToggle = document.getElementById('moveArrowsToggle');

moveArrowsToggle.addEventListener('change', (e) => {

toggleMoveArrows(e.target.checked);

});

// Three-dot menu toggle

const threeDotToggle = document.getElementById('threeDotMenuToggle');

threeDotToggle.addEventListener('change', (e) => {

toggleThreeDotMenu(e.target.checked);

});

}

```

#### Recurring Tasks Panel

```javascript

function setupRecurringPanel() {

const panel = document.getElementById('recurringPanel');

// Frequency selection

const frequencySelect = document.getElementById('frequencySelect');

frequencySelect.addEventListener('change', (e) => {

updateRecurringOptions(e.target.value);

});

// Time picker

const timePicker = {

hour: document.getElementById('hourSelect'),

minute: document.getElementById('minuteSelect'),

meridiem: document.getElementById('meridiemSelect')

};

Object.values(timePicker).forEach(select => {

select.addEventListener('change', updateTimePreview);

});

// Day selection for weekly recurring

const dayCheckboxes = document.querySelectorAll('.day-checkbox');

dayCheckboxes.forEach(checkbox => {

checkbox.addEventListener('change', updateSelectedDays);

});

}

```

### Notification System

```javascript

function showNotification(message, type = 'default', duration = 3000) {

const container = document.getElementById('notification-container');

const notification = document.createElement('div');

notification.className = `notification notification-${type}`;

notification.innerHTML = `

<span class="notification-message">${message}</span>

<button class="notification-close">&times;</button>

`;

// Auto-dismiss timer

const timer = setTimeout(() => {

removeNotification(notification);

}, duration);

// Manual close button

const closeBtn = notification.querySelector('.notification-close');

closeBtn.addEventListener('click', () => {

clearTimeout(timer);

removeNotification(notification);

});

container.appendChild(notification);

// Animate in

requestAnimationFrame(() => {

notification.classList.add('notification-visible');

});

}

// Notification types with styling

const NotificationTypes = {

default: 'blue background, white text',

success: 'green background, white text',

error: 'red background, white text',

warning: 'orange background, white text',

info: 'gray background, white text',

recurring: 'purple background, white text'

};

```

### Drag and Drop System

```javascript

function initializeDragAndDrop(taskElement) {

let draggedElement = null;

let initialY = 0;

let currentY = 0;

// Touch events for mobile

taskElement.addEventListener('touchstart', (e) => {

draggedElement = taskElement;

initialY = e.touches[0].clientY;

taskElement.classList.add('dragging');

});

taskElement.addEventListener('touchmove', (e) => {

if (!draggedElement) return;

e.preventDefault();

currentY = e.touches[0].clientY;

const diffY = currentY - initialY;

// Visual feedback

taskElement.style.transform = `translateY(${diffY}px)`;

// Find drop target

const afterElement = getDragAfterElement(container, currentY);

if (afterElement) {

container.insertBefore(draggedElement, afterElement);

} else {

container.appendChild(draggedElement);

}

});

taskElement.addEventListener('touchend', () => {

if (draggedElement) {

draggedElement.style.transform = '';

draggedElement.classList.remove('dragging');

draggedElement = null;

// Save new order

updateTaskOrder();

autoSave();

}

});

// Mouse events for desktop

taskElement.addEventListener('dragstart', (e) => {

draggedElement = taskElement;

e.dataTransfer.effectAllowed = 'move';

});

taskElement.addEventListener('dragover', (e) => {

e.preventDefault();

e.dataTransfer.dropEffect = 'move';

});

taskElement.addEventListener('drop', (e) => {

e.preventDefault();

if (draggedElement && draggedElement !== taskElement) {

const container = taskElement.parentNode;

const afterElement = getDragAfterElement(container, e.clientY);

if (afterElement) {

container.insertBefore(draggedElement, afterElement);

} else {

container.appendChild(draggedElement);

}

updateTaskOrder();

autoSave();

}

});

}

```

-----

## Event System

### Global Event Handlers

```javascript

// Initialize global event listeners

function initializeGlobalEvents() {

// Keyboard shortcuts

document.addEventListener('keydown', (e) => {

// Undo functionality

if ((e.ctrlKey || e.metaKey) && e.key === 'z' && !e.shiftKey) {

e.preventDefault();

performUndo();

}

// Redo functionality

if ((e.ctrlKey || e.metaKey) && (e.key === 'y' || (e.key === 'z' && e.shiftKey))) {

e.preventDefault();

performRedo();

}

// Close modals with Escape

if (e.key === 'Escape') {

closeAllModals();

}

// Quick add task with Ctrl+Enter

if ((e.ctrlKey || e.metaKey) && e.key === 'Enter') {

const taskInput = document.getElementById('taskInput');

if (taskInput.value.trim()) {

e.preventDefault();

addTaskFromInput();

}

}

});

// Window events

window.addEventListener('beforeunload', (e) => {

// Auto-save before page unload

autoSave();

});

window.addEventListener('resize', () => {

// Responsive adjustments

adjustLayoutForScreenSize();

});

// Visibility change (tab switching)

document.addEventListener('visibilitychange', () => {

if (!document.hidden) {

// Check for recurring tasks when tab becomes visible

watchRecurringTasks();

}

});

}

```

### Custom Event System

```javascript

// Event dispatcher for internal communication

const EventSystem = {

listeners: {},

on(event, callback) {

if (!this.listeners[event]) {

this.listeners[event] = [];

}

this.listeners[event].push(callback);

},

emit(event, data) {

if (this.listeners[event]) {

this.listeners[event].forEach(callback => callback(data));

}

},

off(event, callback) {

if (this.listeners[event]) {

this.listeners[event] = this.listeners[event].filter(cb => cb !== callback);

}

}

};

// Usage examples

EventSystem.on('taskCompleted', (task) => {

updateProgress();

checkCycleCompletion();

showCompletionAnimation(task);

});

EventSystem.on('cycleCompleted', (cycle) => {

incrementCycleCount();

checkMilestoneUnlocks();

triggerCelebration();

});

// Emit events

function completeTask(taskId) {

const task = findTaskById(taskId);

task.completed = true;

EventSystem.emit('taskCompleted', task);

}

```

-----

## Development Guide

### Setup and Installation

```bash

# No build process required - serve static files

# For local development:

python -m http.server 8000

# OR

npx serve .

# OR

php -S localhost:8000

```

### Development Workflow

```javascript

// 1. Enable debug mode

const DEBUG\_MODE = true;

// 2. Use console logging for development

function debugLog(message, data = null) {

if (DEBUG\_MODE) {

console.log(`[miniCycle Debug] ${message}`, data);

}

}

// 3. Testing utilities

const DevTools = {

// Simulate recurring task trigger

triggerRecurringTask(taskId) {

const template = getCurrentCycle().recurringTemplates[taskId];

if (template) {

recreateRecurringTask(template);

}

},

// Force milestone unlock

unlockMilestone(milestone) {

const currentCount = getTotalCycleCount();

setTotalCycleCount(milestone.requirement);

checkMilestoneUnlocks();

setTotalCycleCount(currentCount);

},

// Reset all data

factoryReset() {

if (confirm('This will delete ALL data. Continue?')) {

localStorage.clear();

location.reload();

}

}

};

// Expose dev tools in development

if (DEBUG\_MODE) {

window.DevTools = DevTools;

}

```

### Testing Strategies

```javascript

// Unit testing approach (manual)

function testTaskCreation() {

const originalTaskCount = taskList.length;

addTask("Test task");

console.assert(taskList.length === originalTaskCount + 1, "Task not added");

console.assert(taskList[taskList.length - 1].text === "Test task", "Task text incorrect");

console.log("✅ Task creation test passed");

}

// Integration testing

function testCycleCompletion() {

// Create test cycle with auto-reset

createNewMiniCycle("Test Cycle", true, false);

switchToMiniCycle("Test Cycle");

// Add test tasks

addTask("Task 1");

addTask("Task 2");

// Complete all tasks

taskList.forEach(task => task.completed = true);

// Trigger cycle completion check

setTimeout(() => {

console.assert(taskList.every(task => !task.completed), "Tasks not reset");

console.log("✅ Cycle completion test passed");

}, 4000); // Wait for auto-reset delay

}

```

### Browser Compatibility Testing

```javascript

// Feature detection

function checkBrowserCompatibility() {

const features = {

localStorage: typeof(Storage) !== "undefined",

flexbox: CSS.supports('display', 'flex'),

grid: CSS.supports('display', 'grid'),

customProperties: CSS.supports('color', 'var(--color)'),

serviceWorker: 'serviceWorker' in navigator,

touchEvents: 'ontouchstart' in window

};

console.table(features);

const incompatible = Object.entries(features)

.filter(([feature, supported]) => !supported)

.map(([feature]) => feature);

if (incompatible.length > 0) {

console.warn('Unsupported features:', incompatible);

showNotification('Some features may not work in this browser', 'warning');

}

}

```

-----

## Troubleshooting

### Common Issues and Solutions

#### Storage Issues

```javascript

// Problem: localStorage quota exceeded

function handleStorageQuotaExceeded() {

try {

// Attempt to save

autoSave();

} catch (error) {

if (error.name === 'QuotaExceededError') {

// Clean up old data

cleanupOldCycles();

// Retry save with essential data only

const essentialData = getEssentialData();

saveEssentialData(essentialData);

showNotification('Storage limit reached. Old cycles cleaned up.', 'warning');

}

}

}

// Problem: Corrupted data in localStorage

function validateAndRepairStorage() {

try {

const data = JSON.parse(localStorage.getItem('miniCycleStorage') || '{}');

// Validate structure

Object.entries(data).forEach(([cycleName, cycle]) => {

if (!cycle.tasks || !Array.isArray(cycle.tasks)) {

console.warn(`Repairing cycle: ${cycleName}`);

cycle.tasks = [];

}

// Validate tasks

cycle.tasks = cycle.tasks.filter(task => {

return task && typeof task.id === 'string' && typeof task.text === 'string';

});

// Migrate old schema

cycle.tasks = cycle.tasks.map(migrateTask);

});

// Save repaired data

localStorage.setItem('miniCycleStorage', JSON.stringify(data));

return true;

} catch (error) {

console.error('Storage repair failed:', error);

return false;

}

}

```

#### UI Issues

```javascript

// Problem: Drag and drop not working on mobile

function fixMobileInteractions() {

// Ensure touch events are properly handled

const taskElements = document.querySelectorAll('.task');

taskElements.forEach(element => {

// Remove existing listeners

element.removeEventListener('touchstart', handleTouchStart);

element.removeEventListener('touchmove', handleTouchMove);

element.removeEventListener('touchend', handleTouchEnd);

// Re-add with proper options

element.addEventListener('touchstart', handleTouchStart, { passive: false });

element.addEventListener('touchmove', handleTouchMove, { passive: false });

element.addEventListener('touchend', handleTouchEnd, { passive: false });

});

}

// Problem: Modal not closing properly

function ensureModalCleanup() {

// Force close all modals

const modals = document.querySelectorAll('.modal');

modals.forEach(modal => {

modal.style.display = 'none';

modal.classList.remove('active');

});

// Reset body scroll

document.body.style.overflow = '';

// Clear any modal backdrop

const backdrops = document.querySelectorAll('.modal-backdrop');

backdrops.forEach(backdrop => backdrop.remove());

}

```

#### Performance Issues

```javascript

// Problem: Slow rendering with many tasks

function optimizeTaskRendering() {

const container = document.getElementById('taskList');

// Use document fragment for batch updates

const fragment = document.createDocumentFragment();

taskList.forEach(task => {

const taskElement = createTaskElement(task);

fragment.appendChild(taskElement);

});

// Single DOM update

container.innerHTML = '';

container.appendChild(fragment);

}

// Problem: Memory leaks from event listeners

function cleanupEventListeners() {

// Remove all task-specific listeners

const taskElements = document.querySelectorAll('.task');

taskElements.forEach(element => {

// Clone element to remove all listeners

const newElement = element.cloneNode(true);

element.parentNode.replaceChild(newElement, element);

// Re-add essential listeners

initializeTaskElement(newElement);

});

}

```

### Debug Tools

```javascript

// Diagnostic functions

const Diagnostics = {

// Check data integrity

validateData() {

const storage = JSON.parse(localStorage.getItem('miniCycleStorage') || '{}');

const issues = [];

Object.entries(storage).forEach(([cycleName, cycle]) => {

if (!cycle.tasks) {

issues.push(`${cycleName}: Missing tasks array`);

}

if (cycle.tasks) {

cycle.tasks.forEach((task, index) => {

if (!task.id) {

issues.push(`${cycleName}[${index}]: Missing task ID`);

}

if (!task.text) {

issues.push(`${cycleName}[${index}]: Missing task text`);

}

});

}

});

console.log('Data validation results:', issues.length === 0 ? 'All good!' : issues);

return issues;

},

// Performance monitoring

measurePerformance(functionName, fn) {

const start = performance.now();

const result = fn();

const end = performance.now();

console.log(`${functionName} took ${(end - start).toFixed(2)}ms`);

return result;

},

// Export diagnostic report

exportDiagnostics() {

const report = {

timestamp: new Date().toISOString(),

userAgent: navigator.userAgent,

screenSize: `${screen.width}x${screen.height}`,

windowSize: `${window.innerWidth}x${window.innerHeight}`,

localStorage: {

available: typeof(Storage) !== "undefined",

usage: JSON.stringify(localStorage).length

},

dataValidation: this.validateData(),

cycleCount: Object.keys(JSON.parse(localStorage.getItem('miniCycleStorage') || '{}')).length,

activeTheme: document.body.className

};

// Download as JSON

const blob = new Blob([JSON.stringify(report, null, 2)], { type: 'application/json' });

const url = URL.createObjectURL(blob);

const a = document.createElement('a');

a.href = url;

a.download = `minicycle-diagnostics-${Date.now()}.json`;

a.click();

URL.revokeObjectURL(url);

}

};

// Expose diagnostics in development

if (typeof window !== 'undefined') {

window.MiniCycleDiagnostics = Diagnostics;

}

```

-----

## Appendix: Advanced Customization

\*This section covers advanced topics for extending miniCycle functionality. These features are optional and intended for specialized use cases.\*

### A. Custom Storage Backends

#### Interface Definition

```javascript

// Interface for custom storage

class StorageBackend {

async save(key, data) {

throw new Error('save() must be implemented');

}

async load(key) {

throw new Error('load() must be implemented');

}

async delete(key) {

throw new Error('delete() must be implemented');

}

}

```

#### IndexedDB Implementation

```javascript

class IndexedDBBackend extends StorageBackend {

constructor(dbName = 'miniCycleDB', version = 1) {

super();

this.dbName = dbName;

this.version = version;

this.db = null;

}

async init() {

return new Promise((resolve, reject) => {

const request = indexedDB.open(this.dbName, this.version);

request.onerror = () => reject(request.error);

request.onsuccess = () => {

this.db = request.result;

resolve(this.db);

};

request.onupgradeneeded = (e) => {

const db = e.target.result;

if (!db.objectStoreNames.contains('miniCycle')) {

db.createObjectStore('miniCycle', { keyPath: 'key' });

}

};

});

}

async save(key, data) {

if (!this.db) await this.init();

const transaction = this.db.transaction(['miniCycle'], 'readwrite');

const store = transaction.objectStore('miniCycle');

return new Promise((resolve, reject) => {

const request = store.put({ key, data });

request.onsuccess = () => resolve();

request.onerror = () => reject(request.error);

});

}

async load(key) {

if (!this.db) await this.init();

const transaction = this.db.transaction(['miniCycle'], 'readonly');

const store = transaction.objectStore('miniCycle');

return new Promise((resolve, reject) => {

const request = store.get(key);

request.onsuccess = () => resolve(request.result?.data || null);

request.onerror = () => reject(request.error);

});

}

async delete(key) {

if (!this.db) await this.init();

const transaction = this.db.transaction(['miniCycle'], 'readwrite');

const store = transaction.objectStore('miniCycle');

return new Promise((resolve, reject) => {

const request = store.delete(key);

request.onsuccess = () => resolve();

request.onerror = () => reject(request.error);

});

}

}

// Usage

const customStorage = new IndexedDBBackend();

// Replace localStorage functions

async function autoSaveAsync(overrideTaskList) {

const data = overrideTaskList || getCurrentCycleData();

await customStorage.save('currentCycle', data);

}

```

### B. Plugin System Architecture

#### Plugin Base Class

```javascript

class MiniCyclePlugin {

constructor(name, version) {

this.name = name;

this.version = version;

this.enabled = false;

}

// Lifecycle methods

onLoad() {}

onUnload() {}

onTaskAdded(task) {}

onTaskCompleted(task) {}

onCycleCompleted(cycle) {}

// UI extension points

addMenuItem(label, callback) {

PluginManager.addMenuItem(this.name, label, callback);

}

addTaskAction(icon, label, callback) {

PluginManager.addTaskAction(this.name, icon, label, callback);

}

}

```

#### Plugin Manager

```javascript

const PluginManager = {

plugins: new Map(),

register(plugin) {

this.plugins.set(plugin.name, plugin);

console.log(`Plugin registered: ${plugin.name} v${plugin.version}`);

},

enable(pluginName) {

const plugin = this.plugins.get(pluginName);

if (plugin) {

plugin.enabled = true;

plugin.onLoad();

this.updateUI();

}

},

disable(pluginName) {

const plugin = this.plugins.get(pluginName);

if (plugin) {

plugin.enabled = false;

plugin.onUnload();

this.updateUI();

}

},

triggerEvent(eventName, data) {

this.plugins.forEach(plugin => {

if (plugin.enabled && typeof plugin[eventName] === 'function') {

plugin[eventName](data);

}

});

}

};

```

#### Example Plugin: Time Tracking

```javascript

class TimeTrackingPlugin extends MiniCyclePlugin {

constructor() {

super('TimeTracking', '1.0.0');

this.startTimes = new Map();

}

onLoad() {

// Add timer button to tasks

this.addTaskAction('⏱️', 'Start Timer', (taskId) => {

this.startTimer(taskId);

});

}

onTaskCompleted(task) {

if (this.startTimes.has(task.id)) {

const startTime = this.startTimes.get(task.id);

const duration = Date.now() - startTime;

// Store time data

this.saveTimeData(task.id, duration);

this.startTimes.delete(task.id);

}

}

startTimer(taskId) {

this.startTimes.set(taskId, Date.now());

showNotification('Timer started for task', 'info');

}

saveTimeData(taskId, duration) {

const timeData = JSON.parse(localStorage.getItem('timeTrackingData') || '{}');

if (!timeData[taskId]) timeData[taskId] = [];

timeData[taskId].push({

duration: duration,

date: new Date().toISOString()

});

localStorage.setItem('timeTrackingData', JSON.stringify(timeData));

}

}

// Register and enable plugin

const timeTracker = new TimeTrackingPlugin();

PluginManager.register(timeTracker);

PluginManager.enable('TimeTracking');

```

### C. Custom Theme Creation

#### Theme Definition

```javascript

// Define theme CSS

const customTheme = {

name: 'Ocean Breeze',

unlockRequirement: 25, // cycles

cssClass: 'theme-ocean-breeze'

};

// Add CSS rules

const themeStyles = `

body.theme-ocean-breeze {

background: linear-gradient(135deg, #006994, #00a8cc);

color: #ffffff;

}

body.theme-ocean-breeze .task {

background: rgba(255, 255, 255, 0.1);

border: 1px solid rgba(255, 255, 255, 0.2);

}

body.theme-ocean-breeze .task.completed {

background: rgba(0, 255, 128, 0.2);

}

`;

// Register theme

function registerCustomTheme(theme) {

// Add to theme list

themeList.push(theme);

// Add CSS to document

const styleSheet = document.createElement('style');

styleSheet.textContent = themeStyles;

document.head.appendChild(styleSheet);

// Update theme selector UI

updateThemeSelector();

}

```

### D. Data Recovery Procedures

#### Emergency Backup System

```javascript

const DataRecovery = {

// Create emergency backup

createEmergencyBackup() {

const allData = {

storage: localStorage.getItem('miniCycleStorage'),

active: localStorage.getItem('activeMiniCycle'),

settings: localStorage.getItem('appSettings'),

reminders: localStorage.getItem('remindersSettings'),

theme: localStorage.getItem('selectedTheme')

};

const backup = JSON.stringify(allData);

const blob = new Blob([backup], { type: 'application/json' });

const url = URL.createObjectURL(blob);

const a = document.createElement('a');

a.href = url;

a.download = `minicycle-emergency-backup-${Date.now()}.json`;

a.click();

URL.revokeObjectURL(url);

showNotification('Emergency backup created', 'success');

},

// Restore from emergency backup

restoreFromBackup(file) {

const reader = new FileReader();

reader.onload = (e) => {

try {

const backup = JSON.parse(e.target.result);

// Restore each data type

Object.entries(backup).forEach(([key, value]) => {

if (value) {

const storageKey = this.getStorageKeyMapping(key);

localStorage.setItem(storageKey, value);

}

});

showNotification('Backup restored successfully', 'success');

setTimeout(() => location.reload(), 2000);

} catch (error) {

showNotification('Backup file is corrupted', 'error');

console.error('Restore failed:', error);

}

};

reader.readAsText(file);

},

getStorageKeyMapping(backupKey) {

const mapping = {

storage: 'miniCycleStorage',

active: 'activeMiniCycle',

settings: 'appSettings',

reminders: 'remindersSettings',

theme: 'selectedTheme'

};

return mapping[backupKey] || backupKey;

}

};

```

-----

## Conclusion

This developer documentation provides a comprehensive guide to understanding, extending, and maintaining the miniCycle application. The modular architecture and extensive customization options make it possible to adapt the application for various use cases while maintaining the core cycling methodology that makes miniCycle unique.

For additional technical details, refer to the comprehensive technical documentation. For user-facing information, consult the user manual.

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\*\*Happy coding! 🚀\*\*

element.addEventListener(‘touchend’, handleTouchEnd, { passive: false });

});

}

// Problem: Modal not closing properly

function ensureModalCleanup() {

// Force close all modals

const modals = document.querySelectorAll(’.modal’);

modals.forEach(modal => {

modal.style.display = ‘none’;

modal.classList.remove(‘active’);

});

```

// Reset body scroll

document.body.style.overflow = '';

// Clear any modal backdrop

const backdrops = document.querySelectorAll('.modal-backdrop');

backdrops.forEach(backdrop => backdrop.remove());

```

}

```

#### Performance Issues

```javascript

// Problem: Slow rendering with many tasks

function optimizeTaskRendering() {

const container = document.getElementById('taskList');

// Use document fragment for batch updates

const fragment = document.createDocumentFragment();

taskList.forEach(task => {

const taskElement = createTaskElement(task);

fragment.appendChild(taskElement);

});

// Single DOM update

container.innerHTML = '';

container.appendChild(fragment);

}

// Problem: Memory leaks from event listeners

function cleanupEventListeners() {

// Remove all task-specific listeners

const taskElements = document.querySelectorAll('.task');

taskElements.forEach(element => {

// Clone element to remove all listeners

const newElement = element.cloneNode(true);

element.parentNode.replaceChild(newElement, element);

// Re-add essential listeners

initializeTaskElement(newElement);

});

}

```

### Debug Tools

```javascript

// Diagnostic functions

const Diagnostics = {

// Check data integrity

validateData() {

const storage = JSON.parse(localStorage.getItem('miniCycleStorage') || '{}');

const issues = [];

Object.entries(storage).forEach(([cycleName, cycle]) => {

if (!cycle.tasks) {

issues.push(`${cycleName}: Missing tasks array`);

}

if (cycle.tasks) {

cycle.tasks.forEach((task, index) => {

if (!task.id) {

issues.push(`${cycleName}[${index}]: Missing task ID`);

}

if (!task.text) {

issues.push(`${cycleName}[${index}]: Missing task text`);

}

});

}

});

console.log('Data validation results:', issues.length === 0 ? 'All good!' : issues);

return issues;

},

// Performance monitoring

measurePerformance(functionName, fn) {

const start = performance.now();

const result = fn();

const end = performance.now();

console.log(`${functionName} took ${(end - start).toFixed(2)}ms`);

return result;

},

// Memory usage (Chrome only)

getMemoryUsage() {

if (performance.memory) {

const memory = performance.memory;

console.table({

'Used JS Heap Size': `${(memory.usedJSHeapSize / 1048576).toFixed(2)} MB`,

'Total JS Heap Size': `${(memory.totalJSHeapSize / 1048576).toFixed(2)} MB`,

'JS Heap Size Limit': `${(memory.jsHeapSizeLimit / 1048576).toFixed(2)} MB`

});

} else {

console.log('Memory API not available');

}

},

// Export diagnostic report

exportDiagnostics() {

const report = {

timestamp: new Date().toISOString(),

userAgent: navigator.userAgent,

screenSize: `${screen.width}x${screen.height}`,

windowSize: `${window.innerWidth}x${window.innerHeight}`,

localStorage: {

available: typeof(Storage) !== "undefined",

usage: JSON.stringify(localStorage).length,

quota: this.getStorageQuota()

},

dataValidation: this.validateData(),

cycleCount: Object.keys(JSON.parse(localStorage.getItem('miniCycleStorage') || '{}')).length,

activeTheme: document.body.className,

features: {

serviceWorker: 'serviceWorker' in navigator,

touchSupport: 'ontouchstart' in window,

draggable: 'draggable' in document.createElement('div')

}

};

// Download as JSON

const blob = new Blob([JSON.stringify(report, null, 2)], { type: 'application/json' });

const url = URL.createObjectURL(blob);

const a = document.createElement('a');

a.href = url;

a.download = `minicycle-diagnostics-${Date.now()}.json`;

a.click();

URL.revokeObjectURL(url);

},

getStorageQuota() {

try {

// Estimate storage quota (modern browsers)

if (navigator.storage && navigator.storage.estimate) {

navigator.storage.estimate().then(estimate => {

console.log(`Storage quota: ${(estimate.quota / 1048576).toFixed(2)} MB`);

console.log(`Storage usage: ${(estimate.usage / 1048576).toFixed(2)} MB`);

});

}

} catch (error) {

console.log('Storage quota estimation not available');

}

}

};

// Expose diagnostics in development

if (typeof window !== 'undefined') {

window.MiniCycleDiagnostics = Diagnostics;

}

```

### Recovery Procedures

```javascript

// Emergency data recovery

const DataRecovery = {

// Create emergency backup

createEmergencyBackup() {

const allData = {

storage: localStorage.getItem('miniCycleStorage'),

active: localStorage.getItem('activeMiniCycle'),

settings: localStorage.getItem('appSettings'),

reminders: localStorage.getItem('remindersSettings'),

theme: localStorage.getItem('selectedTheme')

};

const backup = JSON.stringify(allData);

const blob = new Blob([backup], { type: 'application/json' });

const url = URL.createObjectURL(blob);

const a = document.createElement('a');

a.href = url;

a.download = `minicycle-emergency-backup-${Date.now()}.json`;

a.click();

URL.revokeObjectURL(url);

showNotification('Emergency backup created', 'success');

},

// Restore from emergency backup

restoreFromBackup(file) {

const reader = new FileReader();

reader.onload = (e) => {

try {

const backup = JSON.parse(e.target.result);

// Restore each data type

Object.entries(backup).forEach(([key, value]) => {

if (value) {

const storageKey = this.getStorageKeyMapping(key);

localStorage.setItem(storageKey, value);

}

});

showNotification('Backup restored successfully', 'success');

setTimeout(() => location.reload(), 2000);

} catch (error) {

showNotification('Backup file is corrupted', 'error');

console.error('Restore failed:', error);

}

};

reader.readAsText(file);

},

getStorageKeyMapping(backupKey) {

const mapping = {

storage: 'miniCycleStorage',

active: 'activeMiniCycle',

settings: 'appSettings',

reminders: 'remindersSettings',

theme: 'selectedTheme'

};

return mapping[backupKey] || backupKey;

}

};

```

-----

## Conclusion

This developer documentation provides a comprehensive guide to understanding, extending, and maintaining the miniCycle application. The modular architecture and extensive customization options make it possible to adapt the application for various use cases while maintaining the core cycling methodology that makes miniCycle unique.

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\*\*Happy coding! 🚀\*\*