Work Breakdown Structure (WBS)

Project: MCP Agents Laravel UI Generator
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WBS Table Format

Mari kita lihat bagaimana WBS diterapkan pada proyek MCP Agents Laravel UI Generator berbasis deliverable (hasil/output), bukan aktivitas semata. Setiap item WBS sebaiknya dinyatakan sebagai kata benda, seperti "Desain UI/UX" daripada "Mendesain". WBS berhenti di level work package yang dapat diasign ke satu penanggung jawab dan dapat diestimasi durasinya.

Level	Kode	Aktivitas/Deliverable	Deskripsi
1	1.0	MCP Agents Laravel UI Generator	Sistem otomasi pembuatan Laravel UI menggunakan AI multi-agent
2	1.1	Inisiasi Proyek	Definisi ruang lingkup & setup awal
3	1.1.1	Kick-off Meeting	Menyepakati tujuan proyek & stakeholder
3	1.1.2	Project Charter	Dokumen charter & scope definition
3	1.1.3	Stakeholder Engagement Plan	Identifikasi & rencana komunikasi stakeholder
3	1.1.4	Team Formation	Pembentukan tim & assignment role
2	1.2	Infrastructure Setup	Persiapan environment & tools development
3	1.2.1	Repository Structure	Setup GitHub repo & folder structure
3	1.2.2	Development Environment	Konfigurasi Python, Laravel, Docker
3	1.2.3	CI/CD Pipeline	GitHub Actions untuk automated testing

3	1.2.4	Project Planning Documents	WBS, schedule, risk management plan
2	1.3	AI Agent Development	Pengembangan 6 AI agents
3	1.3.1	Prompt Processing Agent	Parser & expander natural language prompts
4	1.3.1.1	NLP Parser Implementation	Implementasi natural language parser
4	1.3.1.2	Prompt Expansion Logic	Logic untuk memperluas user prompts
4	1.3.1.3	Intent Classification	Klasifikasi intent dari user input
4	1.3.1.4	Unit Tests	Testing & validasi prompt agent
3	1.3.2	Draft Generator Agent	Generator HTML preview & template
4	1.3.2.1	Template Generation Engine	Engine untuk generate HTML templates
4	1.3.2.2	Mistral API Integration	Integrasi dengan Mistral AI API
4	1.3.2.3	Preview Output Formatter	Format output untuk preview
4	1.3.2.4	Error Handling	Mekanisme error handling & fallback
3	1.3.3	Layout & Component Generator	Generator Blade files & components
4	1.3.3.1	Blade Template Engine	Integrasi Blade template engine
4	1.3.3.2	Component Structure Generator	Generator struktur component Laravel
4	1.3.3.3	Layout Hierarchy Builder	Builder untuk layout hierarchy
4	1.3.3.4	Reusable Component Library	Library component yang reusable
3	1.3.4	Route Generator Agent	Generator & updater routes Laravel

4	1.3.4.1	Route Definition Parser	Parser untuk route definitions
4	1.3.4.2	Web Routes Updater	Update routes/web.php otomatis
4	1.3.4.3	Controller Scaffolding	Generate controller scaffolding
4	1.3.4.4	Route Conflict Detection	Deteksi konflik route
3	1.3.5	Validator Agent	Validasi syntax, structure, & linting
4	1.3.5.1	Syntax Validation	Validasi syntax Blade & PHP
4	1.3.5.2	Structure Validation	Validasi struktur file & folder
4	1.3.5.3	Linting Integration	Integrasi PHPStan & Laravel Pint
4	1.3.5.4	Acceptance Criteria Checker	Checker untuk acceptance criteria
3	1.3.6	Project Integrator Agent	Integrasi file ke Laravel project
4	1.3.6.1	File Staging Mechanism	Mekanisme staging file sebelum integrasi
4	1.3.6.2	Laravel File Mover	Mover file ke Laravel project
4	1.3.6.3	Backup & Rollback System	Sistem backup & rollback
4	1.3.6.4	Git Branch/PR Creation	Otomasi create branch/PR
2	1.4	Backend Services	Development backend API & services
3	1.4.1	API Layer	REST API untuk orchestration
4	1.4.1.1	FastAPI/Flask Setup	Setup framework FastAPI/Flask
4	1.4.1.2	Endpoint Implementation	Implementasi endpoints (draft, status, approve, integrate)
4	1.4.1.3	Request Validation	Validasi & sanitasi request
4	1.4.1.4	API Documentation	Dokumentasi API (Swagger/OpenAPI)
3	1.4.2	Worker & Queue System	Sistem asynchronous job processing
4	1.4.2.1	Redis/Celery Setup	Setup Redis & Celery

4	1.4.2.2	Job Processing	Implementasi asynchronous job processing
4	1.4.2.3	Retry Mechanism	Mekanisme retry & error handling
4	1.4.2.4	Job Status Tracking	Tracking status job
3	1.4.3	Storage & Database	Sistem storage & database
4	1.4.3.1	Filesystem Structure	Struktur staging filesystem
4	1.4.3.2	Database Setup	Setup SQLite/PostgreSQL
4	1.4.3.3	Job Metadata Schema	Schema untuk job metadata
4	1.4.3.4	Log Storage	Storage & retrieval logs
3	1.4.4	Security Implementation	Implementasi security backend
4	1.4.4.1	API Key Authentication	Sistem autentikasi API key
4	1.4.4.2	Rate Limiting	Implementasi rate limiting
4	1.4.4.3	Input Validation	Validasi & sanitasi input
4	1.4.4.4	Secrets Management	Management secrets via .env
2	1.5	Frontend Development	Development preview UI
3	1.5.1	Preview UI Core	Core UI untuk preview
4	1.5.1.1	HTML/CSS Structure	Struktur HTML/CSS dasar
4	1.5.1.2	Responsive Layout	Design responsive layout
4	1.5.1.3	Tailwind CSS Integration	Integrasi Tailwind CSS
4	1.5.1.4	Accessibility Implementation	Implementasi WCAG accessibility
3	1.5.2	Interactive Components	Komponen interaktif UI
4	1.5.2.1	Prompt Input Interface	Interface untuk input prompt
4	1.5.2.2	Preview Pane Renderer	Renderer untuk preview pane
4	1.5.2.3	Agent Status Panel	Panel status agent

4	1.5.2.4	Accept/Modify Controls	Controls untuk accept/modify
3	1.5.3	JavaScript Functionality	Fungsionalitas JavaScript
4	1.5.3.1	JS Framework Setup	Setup Vanilla JS/Alpine.js
4	1.5.3.2	API Integration	Integrasi dengan backend API
4	1.5.3.3	Code Editor Modal	Modal code editor
4	1.5.3.4	Copy to Clipboard	Feature copy to clipboard
3	1.5.4	Frontend Security	Security & sanitization frontend
4	1.5.4.1	HTML Sanitization	Sanitasi HTML preview
4	1.5.4.2	Iframe Sandbox	Sandbox iframe untuk preview
4	1.5.4.3	XSS Prevention	Pencegahan XSS attacks
4	1.5.4.4	CSP Setup	Setup Content Security Policy
2	1.6	Testing & Quality Assurance	Pengujian sistem & QA
3	1.6.1	Unit Testing	Unit tests untuk semua komponen
4	1.6.1.1	Agent Unit Tests	Unit tests untuk agents (pytest)
4	1.6.1.2	API Endpoint Tests	Tests untuk API endpoints
4	1.6.1.3	Frontend Component Tests	Tests untuk frontend components
4	1.6.1.4	Test Coverage Report	Report coverage testing
3	1.6.2	Integration Testing	Integration tests
4	1.6.2.1	Agent Orchestration Tests	Tests orchestration agents
4	1.6.2.2	File Move & Route Tests	Tests file move & route updates
4	1.6.2.3	API-Frontend Integration	Tests integrasi API-Frontend
4	1.6.2.4	Laravel Integration Tests	Tests integrasi dengan Laravel
3	1.6.3	End-to-End Testing	E2E testing complete workflow

4	1.6.3.1	Workflow Testing	Testing complete workflow
4	1.6.3.2	Preview Pipeline Validation	Validasi preview pipeline
4	1.6.3.3	User Acceptance Testing	UAT dengan user
4	1.6.3.4	Performance Testing	Testing performance sistem
3	1.6.4	Quality Assurance	QA process
4	1.6.4.1	Code Review	Process code review
4	1.6.4.2	Security Audit	Audit security sistem
4	1.6.4.3	Cross-browser Testing	Testing cross-browser
4	1.6.4.4	Bug Tracking	Tracking & resolution bugs
2	1.7	Documentation	Dokumentasi lengkap sistem
3	1.7.1	Technical Documentation	Dokumentasi teknis
4	1.7.1.1	Architecture Documentation	Dokumentasi arsitektur sistem
4	1.7.1.2	API Documentation	Dokumentasi API lengkap
4	1.7.1.3	Agent Workflow Documentation	Dokumentasi workflow agents
4	1.7.1.4	Deployment Guide	Guide untuk deployment
3	1.7.2	User Documentation	Dokumentasi untuk user
4	1.7.2.1	README Creation	Pembuatan README.md
4	1.7.2.2	User Guide & Tutorials	Guide & tutorial untuk user
4	1.7.2.3	FAQ & Troubleshooting	FAQ & troubleshooting guide
4	1.7.2.4	Video Tutorials	Video tutorial (optional)
3	1.7.3	Code Documentation	Dokumentasi code
4	1.7.3.1	Inline Comments	Inline code comments

4	1.7.3.2	Python Docstrings	Docstrings untuk Python code
4	1.7.3.3	JSDoc	JSDoc untuk JavaScript
4	1.7.3.4	Example Code Snippets	Example code snippets
3	1.7.4	Wiki & Knowledge Base	Wiki & knowledge base
4	1.7.4.1	GitHub Wiki Setup	Setup GitHub Wiki
4	1.7.4.2	Best Practices Guide	Guide best practices
4	1.7.4.3	Contributing Guidelines	Guidelines untuk contributing
4	1.7.4.4	Changelog	Maintenance changelog
2	1.8	Deployment & Release	Deployment ke production
3	1.8.1	Pre-deployment	Persiapan sebelum deployment
4	1.8.1.1	Final Testing	Final testing & validation
4	1.8.1.2	Performance Optimization	Optimasi performance
4	1.8.1.3	Security Hardening	Hardening security
4	1.8.1.4	Backup Strategy	Strategi backup
3	1.8.2	Deployment	Proses deployment
4	1.8.2.1	Production Environment	Setup production environment
4	1.8.2.2	Database Migration	Migration database
4	1.8.2.3	Service Deployment	Deployment services
4	1.8.2.4	Monitoring Setup	Setup monitoring
3	1.8.3	Release Management	Management release
4	1.8.3.1	Version Tagging	Tagging version (semantic versioning)
4	1.8.3.2	Release Notes	Pembuatan release notes
4	1.8.3.3	Package Distribution	Distribusi package (PyPI, npm)
4	1.8.3.4	Announcement	Announcement & communication

3	1.8.4	Post-deployment	Aktivitas post-deployment
4	1.8.4.1	Monitoring & Logging	Monitoring & logging sistem
4	1.8.4.2	Bug Hotfix Process	Process hotfix bugs
4	1.8.4.3	User Feedback Collection	Pengumpulan feedback user
4	1.8.4.4	Performance Metrics	Tracking performance metrics
2	1.9	Project Closure	Penutupan proyek
3	1.9.1	Final Deliverables	Deliverables akhir
4	1.9.1.1	Codebase Handover	Handover complete codebase
4	1.9.1.2	Documentation Package	Package dokumentasi lengkap
4	1.9.1.3	Demo Application	Aplikasi demo
4	1.9.1.4	Training Materials	Material training
3	1.9.2	Project Review	Review proyek
4	1.9.2.1	Lessons Learned	Dokumentasi lessons learned
4	1.9.2.2	Success Criteria Evaluation	Evaluasi success criteria
4	1.9.2.3	Stakeholder Feedback	Feedback dari stakeholder
4	1.9.2.4	Final Project Report	Report akhir proyek
3	1.9.3	Maintenance Plan	Rencana maintenance
4	1.9.3.1	Support Strategy	Strategi support & maintenance
4	1.9.3.2	Update Schedule	Schedule update & patch
4	1.9.3.3	Community Engagement	Rencana engagement community
4	1.9.3.4	Enhancement Roadmap	Roadmap enhancement future

Deliverables Summary

WBS Code	Deliverable	Owner	Duration
1.0	Project Management Documents	PM	2 weeks
2.0	6 AI Agents (fully tested)	Backend Engineer	8 weeks
3.0	Backend API & Services	Backend Engineer	4 weeks
4.0	Frontend Preview UI	Frontend Engineer	4 weeks
5.0	Test Suite & QA Reports	Both Engineers	2 weeks
6.0	Complete Documentation	Both Engineers	2 weeks
7.0	Deployed System	Both Engineers	1 week
8.0	Project Closure Package	PM	1 week

Total Estimated Duration: 14 weeks (98 days)