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Solution Overview

Agent Design is an AI-powered interior design platform built on Microsoft Azure, utilizing Stable Diffusion models via Azure AI Foundry. The solution offers intelligent room modification through a scalable, containerized architecture deployed on Azure Container Apps. It integrates with Azure Monitor, Application Insights, and Azure Blob Storage, enabling users to generate professional-grade interior visualizations at scale while ensuring enterprise-level security and compliance.

Problem Statement

Modern businesses and individuals face increasing operational complexity in interior space visualization due to:

- High costs for professional interior design consultations and specialized software licensing

- Time-intensive manual room design conceptualization and revision processes
- Lack of scalable solutions for consistent interior space visualization
- Limited access to advanced AI-powered space design tools
- Difficulty integrating design generation into existing planning workflows
- Inability to visualize final interior spaces from initial concepts or descriptions

Traditional interior space planning processes require multiple consultation rounds and substantial time investment, making high-quality room visualization and rapid design iteration inaccessible for many users and organizations.

Solution Detail

Agent Design delivers AI-powered image creation through Azure-native capabilities:

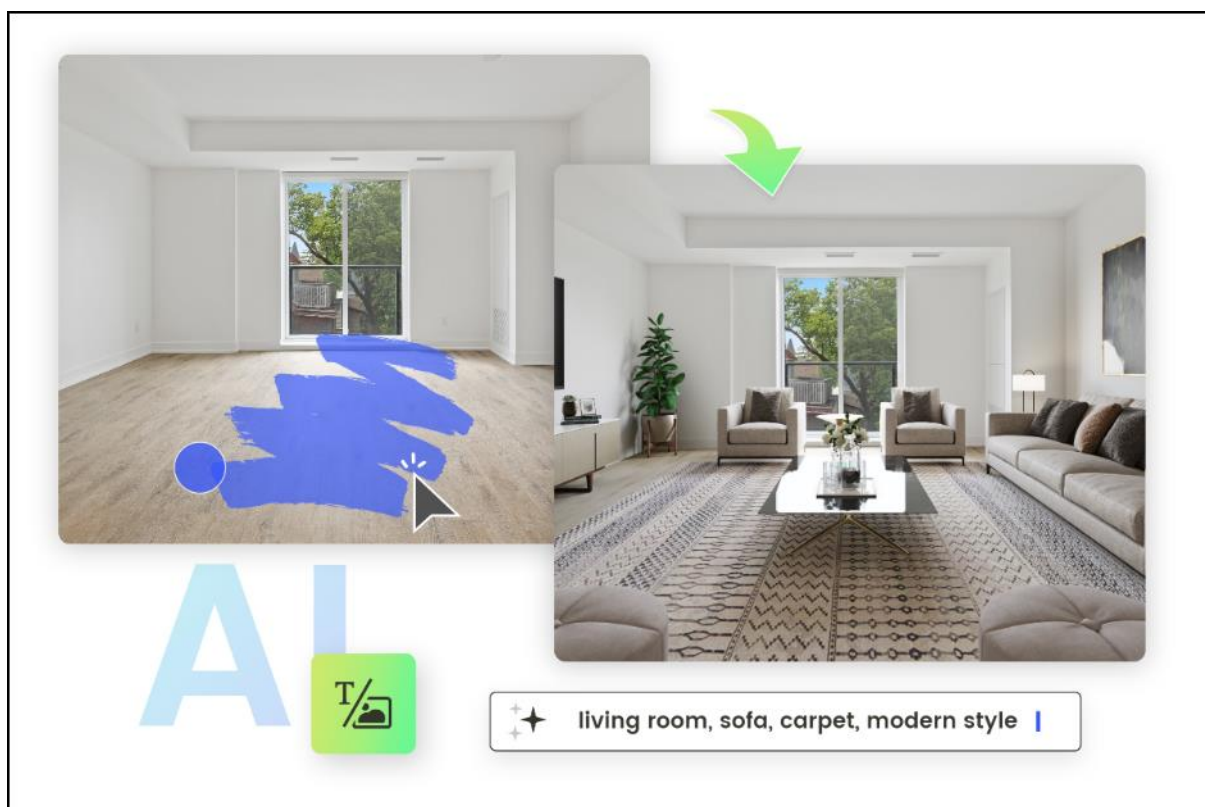


Figure: Interior room visual transformed using inpainting

Core Features

- **Intelligent Inpainting:** Stable Diffusion models at Azure Foundry for AI-powered selective editing and object replacement within existing images
- **Scalable Processing:** Auto-scaling container infrastructure handles variable workloads
- **Enterprise Integration:** RESTful APIs enable seamless workflow integration

Primary Use Cases

- **AI-Powered Interior Design:** Users upload existing room images and specify areas for redesign through masks or selections. The Agent intelligently fills, replaces, or modifies selected regions while maintaining visual coherence with the surrounding space. Perfect for renovation planning, furniture replacement, and interior space enhancement.

Technical Architecture

Agent Design employs a cloud-native microservices architecture deployed on Azure Container Apps, utilizing Azure AI Foundry for model inference and Azure's observability stack for comprehensive monitoring.

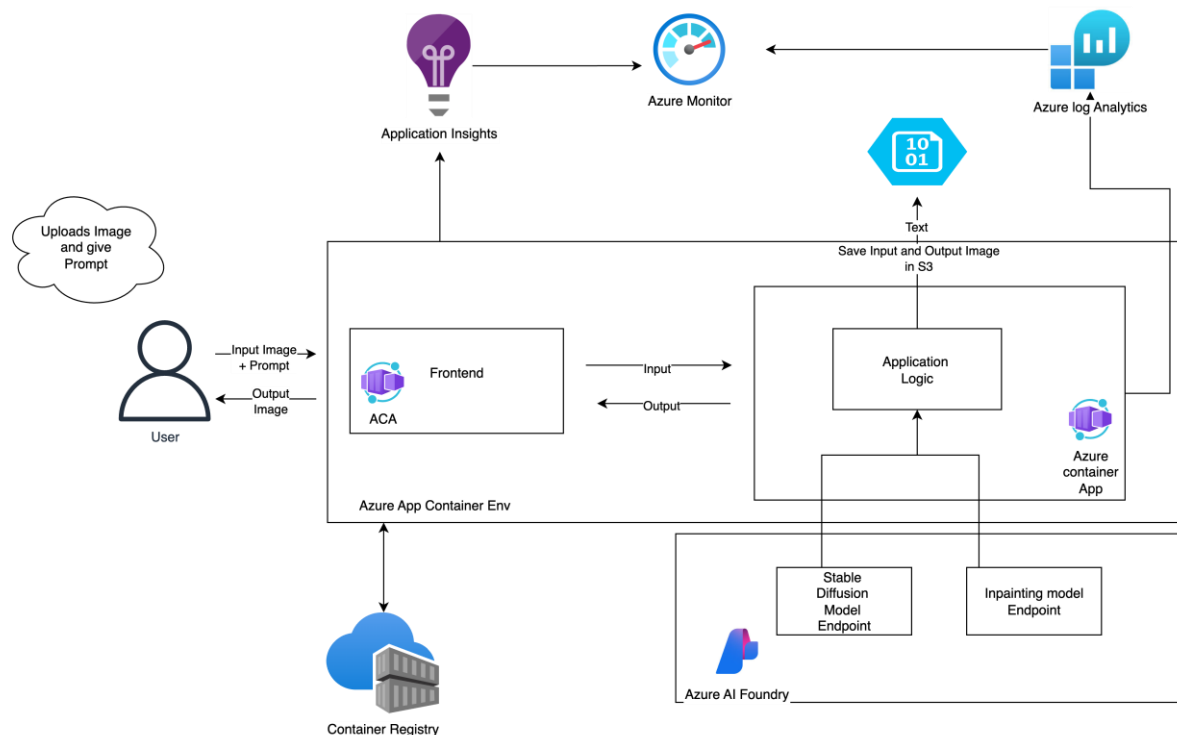


Figure: Agent Design Architecture

Architecture Highlights:

- Frontend React application hosted on Azure Container Apps with auto-scaling
- Azure AI Foundry provides managed Stable Diffusion and Inpainting model endpoints (**Stable-Diffusion-3.5-Large**).
- Real-time telemetry ingestion through Azure Monitor and Application Insights
- Secure image storage and retrieval via Azure Blob Storage
- Container orchestration and registry management through Azure Container Registry
- Comprehensive logging and analytics with Azure Log Analytics.

Application Logic Flow

The core application logic orchestrates the end-to-end interior space design process:

Input Stage:

- User selects operation type (Room Modification) through the UI interface
- Room Modification: User uploads existing room image and provides redesign prompt
- Frontend validates input parameters and determines processing workflow based on UI selection
- Input data and room images are temporarily stored in Azure Blob Storage

Processing Stage:

- Application Logic receives request from frontend with operation type specified by UI
- Based on UI selection: Routes to **Inpainting Stable Diffusion Model Endpoint** (for room modification) in Azure AI Foundry
- Model endpoints process requests using GPU-accelerated inference
- Application Logic handles model response validation and error handling

Output Stage:

- Generated room design is returned from AI Foundry to Application Logic
- Application Logic performs post-processing (format conversion, metadata tagging)
- Final output room visualization is stored in Azure Blob Storage with unique identifier
- Response containing image URL and metadata is sent back to frontend
- User receives processed room design for download or further editing

Key Components

| Component | Azure Service |
|----------------------------|--------------------------------------|
| Frontend Application | Azure Container Apps |
| AI Model Hosting | Azure AI Foundry |
| Image Storage | Azure Blob Storage |
| Container Management | Azure Container Registry |
| Monitoring & Observability | Azure Monitor + Application Insights |
| Logging & Analytics | Azure Log Analytics |
| Security & Identity | Azure Active Directory |

Integration Points

- **API Gateway:** RESTful endpoints for external system integration
- **Storage:** Direct integration with Azure Blob Storage for image persistence

- **Monitoring:** Native Azure Monitor telemetry collection
- **Authentication:** Azure AD SSO and RBAC integration
- **CI/CD:** Azure DevOps and GitHub Actions support
- **Notification:** Azure Notification Hubs, PagerDuty

Use Cases

- **Room Renovation and Redesign:** Modify existing room images to explore different design possibilities and renovation options
- **Personalized Space Design:** AI-assisted creation of customized interior concepts based on user preferences, lifestyle, and functional requirements
- **Virtual Staging and Styling:** Consistent visual presentation of spaces with furniture, decor, and design elements for real estate and marketing
- **Rapid Design Prototyping:** Quick visual mock-ups of interior spaces for presentations, proposals, and design exploration

Customer Pain Points Addressed

- **Cost Reduction:** Significant decrease in design outsourcing expenses
- **Time Efficiency:** Image creation time reduced from hours to minutes
- **Skill Barriers:** No specialized design expertise required
- **Scalability:** Handle concurrent image generation requests
- **Quality Consistency:** Ensure uniform output quality across projects

Industry-Specific Applications

- **Residential Space Planning:** Home styling, room makeovers, and space optimization
- **Commercial Space Design:** Office layouts, retail environments, and hospitality venues
- **Real Estate and Property:** Virtual staging for marketing and space planning
- **Retail and E-commerce:** Product visualization in realistic room settings
- **Hospitality and Events:** Venue styling and space configuration planning

Sample Customer Journey

| Scenario | Before Agent Design | After Agent Design |
|---------------------------------|-------------------------------|------------------------------------|
| Room Design Concept Creation | 2-3 days for initial concepts | 10-15 minutes for multiple options |

| | | |
|------------------------|--|--|
| Client Revision Cycles | Multiple in-person meetings over weeks | Real-time digital iterations |
| Design Exploration | Limited by designer time/availability | Unlimited concept variations on-demand |

Technical Requirements

- Azure Container Apps with auto-scaling capability
- Azure AI Foundry with GPU-enabled compute instances
- Azure Blob Storage
- Azure Monitor and Application Insights enabled
- Virtual Network with private endpoints for secure communication
- Azure Container Registry for image management

Security Architecture

- Zero Trust Architecture using Azure AD and Entra ID
- Encryption at Rest and In Transit using Azure Key Vault and TLS 1.2+
- Private Networking via VNet, NSGs, and Azure Firewall
- Credential Management using Azure Key Vault
- Audit Trails using Microsoft Defender for Cloud and Log Analytics

Compliance Features

- SOC 2 Type II, ISO 27001, GDPR compliance
- Data residency controls for regional compliance requirements
- Role-based access control (RBAC) for resource management
- Automated compliance reporting through Azure Policy

Performance Considerations

- Container instances scale on request volume
- Reduced inference times for standard generations
- Stream telemetry ingestion
- Partition ML pipelines

Tools and Azure Services Used

- **Compute:** Azure Container Apps, Azure AI Foundry
- **Storage:** Azure Blob Storage, Azure Container Registry
- **AI/ML:** Azure AI Foundry, Stable Diffusion and Inpainting models
- **Monitoring:** Azure Monitor, Application Insights, Log Analytics

- **Security:** Azure Key Vault, Azure Active Directory, Azure Firewall
- **Networking:** Azure Virtual Network
- **DevOps:** Azure DevOps, GitHub Actions

Users of Agent

- **Design Professionals and Firms:** Interior designers, architects, and creative teams
- **Homeowners and Property Owners:** Individuals planning renovations, redesigns, or new spaces
- **Real Estate Professionals:** Developers, and property managers needing staging solutions
- **Business Owners:** Retail, hospitality, and office space planners
- **Furniture and Decor Retailers:** Sales teams showcasing products in room contexts

Dependencies

- Active Azure subscription with AI Foundry access
- Sufficient compute quotas for GPU-enabled inference
- Network connectivity for real-time model inference
- Access to telemetry and historical incident data
- Azure DevOps or GitHub for CI/CD integration

Key Benefits and Differentiators

- **Enterprise-Grade Scalability:** Handle enterprise workloads with Azure's global infrastructure
- **Cost-Effective:** Pay-per-use model with no upfront licensing fees
- **AI-Native:** Purpose-built for generative AI workloads on Azure
- **Security-First:** Built-in compliance and enterprise security controls
- **Integration-Ready:** RESTful APIs for seamless workflow integration
- **Continuous Innovation:** Regular model updates through Azure AI Foundry

Value Proposition

Agent Design revolutionizes interior space visualization on Azure—cutting design consultation costs by up to 70% and boosting design iteration speed by 95%. It delivers scalable, high-quality room visualizations without the traditional time and resource burden.

Conclusion

Agent Design is the next frontier of AI-driven creativity on Azure. Combining generative intelligence with enterprise-grade security and scalability, it enables autonomous design workflows and empowers teams to lead in the AI-first creative era.