The SmartProof AI solution being developed on Azure is a cloud-native, modular, and scalable platform designed to automate and improve Toyota's product information search and marketing asset compliance processes. The system aims to reduce manual review effort, shorten approval timelines, and increase the accuracy and consistency of marketing materials by combining intelligent automation with human validation where necessary.

SmartProof will be entirely hosted within Microsoft Azure using a combination of AI, data, and application services. The architecture is designed to be maintainable, auditable, and expandable, ensuring that it can evolve as Toyota's digital ecosystem grows or as new use cases emerge.

At a high level, the solution includes three main layers: the frontend user interface, the backend orchestration and APIs, and the AI intelligence and data layer. Each part plays a specific role and communicates through defined APIs and shared data structures, which keeps the system modular and easy to extend.

The **frontend** will be a single-page web application built using React and hosted in Azure App Service. It will provide a clean interface where users can upload marketing assets (such as brochures, PDFs, or images), search product information, view flagged issues, and download compliance reports. The frontend will communicate with the backend via secure REST APIs. It will also include access control to ensure that users only see content appropriate for their role (for example, proof managers, reviewers, or agency users).

The **backend** will use Azure Functions to handle the orchestration of user requests. These serverless functions will perform actions such as uploading files, triggering AI analysis, retrieving results, and serving reports back to the frontend. The functions will not maintain state, making them lightweight and easily scalable. All stateful information, such as analysis progress and file metadata, will be stored in Azure Blob Storage and the AI Foundry workspace.

The **data and intelligence layer** is where the main value of the solution resides. It will use Azure Blob Storage to store all marketing assets, extracted data, and generated reports. Every upload will be versioned and include metadata like model, year, and source, enabling easy traceability. Azure Document Intelligence will handle text and table extraction from PDFs and image files, converting unstructured content into structured data for analysis.

Azure AI Search will act as a unified search index for structured (such as product specifications) and unstructured (such as documents or brand guidelines) information. This allows the system to retrieve product information quickly and accurately based on a user query.

The intelligence will be provided by a network of Azure AI Foundry Agents that collaborate to perform specific functions. The **Orchestrator Agent** is the entry point for every process and coordinates the actions of all other agents. The **Search Agent** uses retrieval-augmented generation to search and retrieve accurate information from the AI Search index. The **Asset Parser Agent** processes uploaded assets using Azure Document Intelligence and converts the results into structured data. The **Compliance Rules Agent** then compares the parsed asset data with the retrieved API product data, applying rule-based and AI-driven checks to detect missing disclaimers, brand inconsistencies, or product inaccuracies. Finally, the **Critic Agent** reviews all results, validates confidence levels, and produces a summarized decision on whether the asset passes or fails compliance.

Once the analysis is completed, a report generation process will produce an HTML and PDF summary that highlights the issues found, the suggested corrections, the related rules or source references, and the confidence levels. This report will be stored back in Blob Storage and can be downloaded or viewed by reviewers through the web interface.

All agents will work asynchronously through shared storage and message state, rather than calling each other directly. This approach enables independent updates and parallel processing, allowing new agents to be introduced later without impacting the rest of the system.

The architecture ensures security, governance, and traceability. Authentication will be handled through Azure Active Directory, and role-based access control (RBAC) will define permissions for different user groups. Audit logs will record all search activities, uploads, and compliance checks to meet Toyota's governance standards.

From a capability standpoint, the SmartProof system will provide:

- AI-powered semantic and structured search of product information.

- Automated text and table extraction from marketing materials.

- Intelligent comparison between marketing assets and product data.

- Automated brand, PIT, and legal compliance checks.

- Confidence scoring and explainability of AI outputs with cited sources.

- Human-in-the-loop validation and approval capability.

- Version control, traceability, and audit logging.

- Secure, role-based access for Toyota and agency users.

- Configurable notification and alert mechanisms for workflow events.

Testing for SmartProof will include several key types to ensure quality, accuracy, and reliability across the technical stack.

Functional Testing will validate that all features perform as expected — including asset upload, product search, compliance checking, and report generation. Each AI agent's task execution and the overall workflow orchestration will be tested end to end.

Integration Testing will ensure that all Azure components interact correctly — particularly the flow between Blob Storage, Document Intelligence, AI Search, and AI Foundry agents. This will verify that the system processes data seamlessly without breaking between services.

Performance and Load Testing will be carried out to confirm that the solution can handle multiple concurrent users and large file uploads without significant latency. It will also test the search performance and the time required for complete compliance analysis under expected workload conditions.

Security Testing will verify authentication and authorization flows through Azure Active Directory, ensuring that role-based access control functions correctly and that sensitive data in storage or transmission is properly encrypted.

AI Accuracy and Validation Testing will measure the correctness and reliability of AI outputs. For example, it will compare AI-detected compliance flags against manually validated results to ensure precision and recall thresholds meet expectations.

User Acceptance Testing (UAT) will involve Toyota's planners, marketers, and reviewers using the system in simulated real-world conditions to confirm that it meets business needs and usability expectations.

From a solution perspective, several acceptance criteria define successful delivery of SmartProof. The system must enable accurate and fast search of Advanced Product Information across structured and unstructured data sources. It must automatically detect and flag compliance issues such as missing disclaimers, product inconsistencies, and brand errors with at least a defined confidence level (for example, 85% or higher). Reports must be generated automatically, stored securely, and easily retrievable. Users must be able to trace AI decisions with citations and confidence indicators. The platform must handle multiple concurrent uploads and analysis runs without errors. It must comply with Toyota's data security and governance policies, enforce role-based access control, and maintain a complete audit trail of all actions. Finally, the user experience must be intuitive, responsive, and require minimal manual effort for day-to-day operations.

Overall, SmartProof will serve as an intelligent, end-to-end automation layer that improves accuracy, speed, and consistency in Toyota's marketing approval process. It combines the reliability of Azure infrastructure with the flexibility of modular AI agents, creating a maintainable and future-proof foundation for enterprise-scale AI adoption.