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WHITEpaper

Clean Core Compliance in Quality Assurance

Testing customer-specific developments with the ABAP Test Cockpit

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Anyone looking to implement Clean Core in the SAP world sustainably cannot do without the ABAP Test Cockpit. Only through continuous code quality monitoring, centralized testing, and integrated security checks can cost-effective, future-proof system landscapes be created.

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Ensuring Clean Core compliance in the quality assurance of customer-specific developments using the ABAP Test Cockpit

The Clean Core paradigm is increasingly coming into focus in the development of customer-specific solutions. The proven tools of static code analysis can be used for quality assurance. The ABAP Test Cockpit (ATC) plays a particularly important role in this context. It can be deployed locally on the system itself or centrally, ideally from the ABAP environment on the Business Technology Platform (BTP).

The ATC is a powerful tool for developing high-quality and secure software components and maintaining them over the long term, making it an integral part of modern quality assurance processes. New requirements and technological changes necessitate continuous adaptation of the existing codebase. To reliably keep track of these changes, regular testing of both existing and newly developed components must be performed.

The ATC provides **test variants** with comprehensive **checks**. The scope of testing can be customized in detail, for example, to meet project-specific requirements or to centrally ensure compliance with requirements. Custom test variants for different purposes can be created, and open-source checks or customer-specific checks can also be integrated.

In addition to the traditional requirements for robust and maintainable code – and now also Clean Core compliance – there is a growing focus on application security in heterogeneous solution landscapes. Here, too, the ABAP Test Cockpit plays a central role. The **Code Vulnerability Analyzer** (CVA) identifies vulnerabilities and potential targets for cyberattacks. With a central ATC instance on the BTP, all systems can be tested uniformly; unlike on-premises systems with local ATC instances, the CVA can be used without an additional license. Another advantage of centralized use is uniform reporting of security issues across the entire development landscape.

To ensure a system remains durable and usable with the lowest possible TCO (**Total Cost of Ownership**), clear prerequisites must be met that proactively account for future development. ATC checks and the open-source checks listed below (ATC Open Source Checks page 8) aim to make systems future-proof and prepare them for technological changes.

Testing Tools and the Clean Core Paradigm

Security and quality are critical characteristics of the software lifecycle. Consistent quality assurance measures and the use of project-specific testing tools play an important role in this context. The SAP standard provides basic tools. Extensions can significantly improve compliance with current development standards. This facilitates the integration of new technologies. When combined, these extensions can optimize costly customization or, ideally, eliminate it entirely.

ABAP Test Cockpit (ATC)

The ABAP Test Cockpit is a tool integrated into the system for static code analysis. It can be accessed via the **ATC** transaction in the SAP GUI, in development environments such as Eclipse or the ABAP Workbench, as well as via Fiori applications, such as the Custom Code Migration App. The ATC performs the following tasks: advanced program checks, static performance tests, module tests with ABAP Unit, static usability checks, and package checks.

Check Types

A distinction is made between local checks and remote checks. The latter delegate static code checks to a central reference check system, such as the ATC of the BTP ABAP environment. Remote checks are performed via an RFC interface. Checks are grouped into check categories, which bundle checks related to thematically similar aspects. Executing a check requires a corresponding check variant. There, checks from different categories can be combined. When testing a system, there are two basic scenarios: the developer scenario and the QA scenario. In both cases, a test run is initiated, which can be executed immediately, at a one-time or recurring point in time. Developers typically apply tests on a small scale to a specific development; the QA scenario involves scheduled, usually system-wide test runs.

Integration into the Development Process

ATC checks can be automatically integrated into the transport landscape. This integration ensures that only transport requests that meet the specified quality and security requirements are released. Developers can use checks on an ad hoc basis as needed. Formal checks via a quality gate prevent the release of a transport request if requirements are not met. The ATC baseline can be used for existing code: All findings discovered up to that point are recorded and are not reported in new check runs. This allows new checks to focus on recently modified content.

Code Vulnerability Analyzer (CVA)

The Code Vulnerability Analyzer is a check integrated into the ATC that analyzes the security of the customer's own ABAP code.

Custom ABAP applications are a target for cyberattacks, which can have serious consequences if successful. The CVA is included in the BTP without a license, while it can be activated on on-premise systems with an appropriate license.

The Analyzer examines applications for fundamental security-related issues such as SQL injection, ABAP code injection, call injection, OS command injection, directory traversal, web exploits, backdoors, access to sensitive data, and missing or incorrect authorization checks. This type of check is of central importance for the system and individual applications and should therefore be part of the Quality Gate.

Clean Core Paradigm

The Clean Core paradigm aims to isolate customer-specific customizations from the standard system so that updates can be implemented more smoothly. To this end, customer customizations are categorized into four levels, with Level A representing the highest Clean Core level and Level D, for example, encompassing modifications – which are therefore very maintenance-intensive. In Cloud ERP systems and on the BTP, all customizations must comply with Level A or Level B.

Central ATC Environment

A central ATC landscape consolidates quality assurance across all systems. Remote tests are performed on satellite systems via a central reference test system. The results are managed centrally, and quality development is presented transparently. This reduces licensing and operating costs, establishes a uniform quality standard, and ensures that security-related tests such as the Code Vulnerability Analyzer (CVA) can be utilized across the entire landscape. Tests support developers early in the development cycle, while the master system serves as a formal component of governance and quality gate processes.

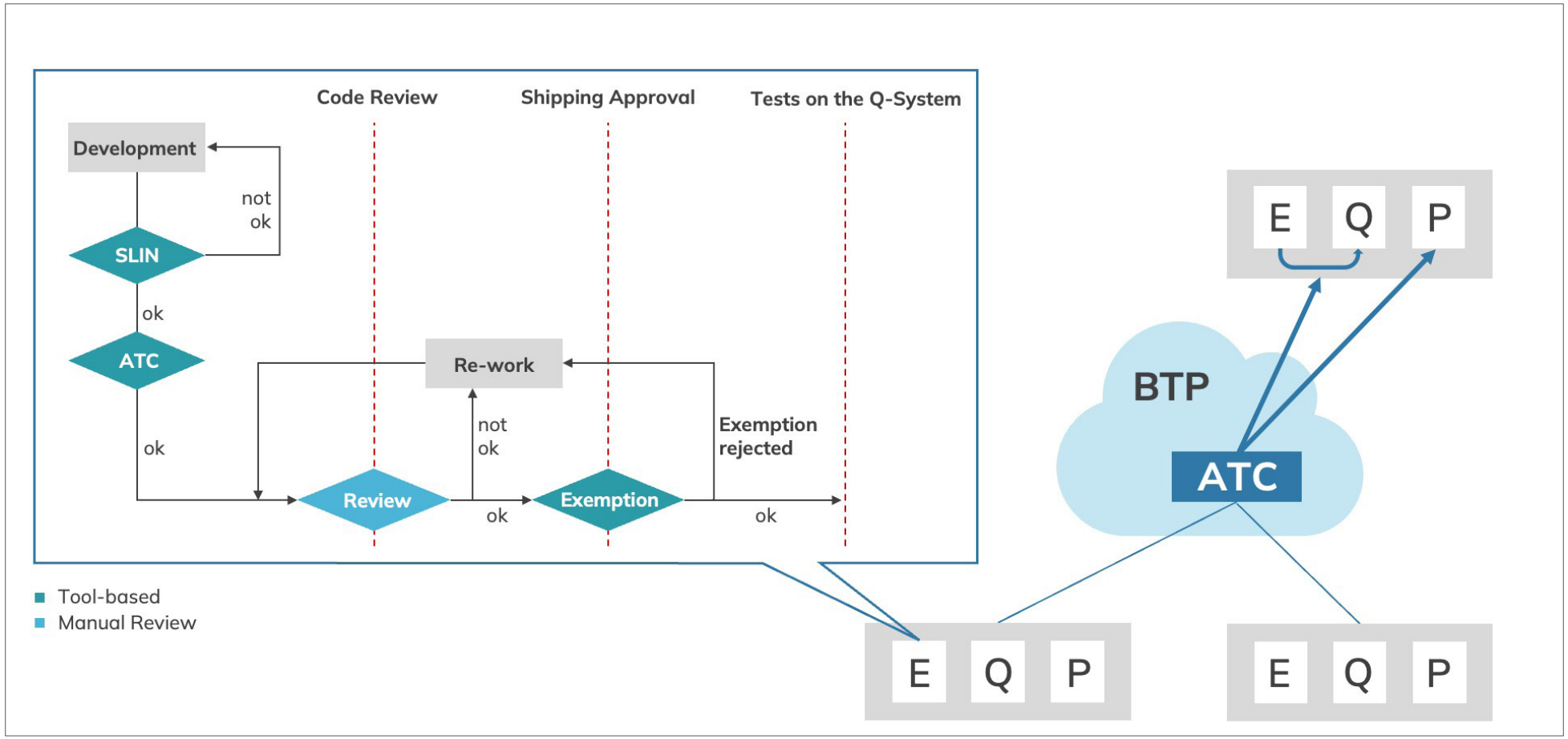

Figure 1: Central ATC Environment

Basis System Checks (SAP Standard)

SAP standard checks form the technical foundation of modern and sustainable quality assurance. They cover key areas such as syntax, performance, and security checks. By combining the default variants with specialized cloud and security checks, SAP supports a clear, forward-looking development strategy.

ABAP for Cloud-Development

The **ABAP for Cloud Development** check variant is the central predefined check variant for modern SAP systems. The check addresses the conformance of the language scope according to the current ABAP language variant **ABAP for Cloud Development**.

ABAP Clean Core Development

The Clean Core checks, formerly known as ABAP 3-Tier checks, originated from the Cloud Readiness check. These checks continue the underlying ideas and initiatives. This check variant aims to support the transition to the Clean Core model.

S/4 Readiness / Functional DB

The S/4 Readiness Check is one of the first checks related to modern cloud systems and is used to identify areas of code that could pose problems during an S/4 migration. The Functional DB checks include key prerequisites for a migration to SAP HANA. There, the custom code in the system is checked for various functions. Findings include native SQL in the code as well as DB hints, ADBC (ABAP Database Connectivity), special DDIC function modules, pool and cluster tables, and non-robust ABAP code, such as ORDER BY.

SLIN_SEC

SLIN_SEC serves as a central entry point for security checks in a system. The check variant's main feature is the Code Vulnerability Analyzer (CVA).

Usage of APIs

The standard check "Usage of APIs" serves as the basis for the classification check of the „Kernseife" project and the Cloudification Repository. This check categorizes published APIs according to SAP's Clean Core Level specifications and identifies outdated developments and usage patterns.

The levels include: published APIs (SAP-recommended, release-independent, and upgrade-stable APIs that are transaction-consistent and thus RAP-compatible), classic APIs, and internal APIs. In contrast, there are "No APIs," which are not recommended and should not be used. They should be replaced with modern, recommended alternatives. The following figure shows the classification of the findings.

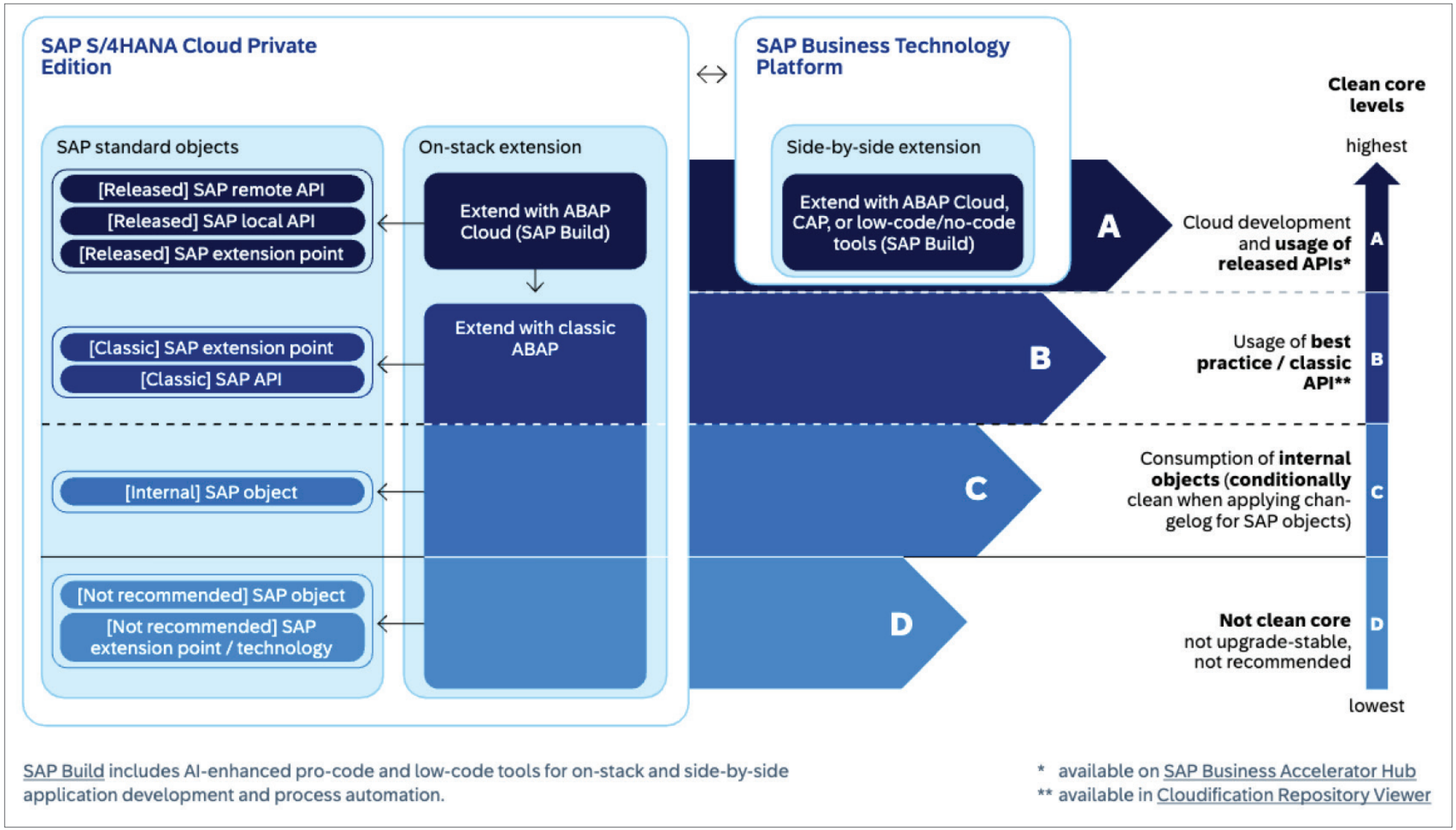

Figure 2 : Clean Core Level and API Classification of SAP
Source: https://www.sap.com/documents/2024/09/20aece06-d87e-0010-bca6-c68f7e60039b.html

ATC Open Source Checks

The ATC allows you to integrate custom checks both locally on the system and centrally, for example via the BTP. Various open-source checks are available for this purpose.

Project „Kernseife“ (Curd Soap)

Project „Kernseife“ is an SAP open-source project that allows you to evaluate on-premise systems with regard to the Clean Core paradigm. It automates the analysis of an entire system and provides an accurate, system-wide overview of the status of technical debt in relation to Clean Core Levels A-D. The results can be evaluated using an SAP Build Workzone application in the BTP or exported in Excel format. „Kernseife“ therefore provides a way to analyze a system’s customer-specific code and can be used as part of a **RISE with SAP** transformation. Cloud systems have stricter implementation requirements. The Clean Core classification evaluates all custom code objects and provides the user with an overview (see BTP application, Figure 3).

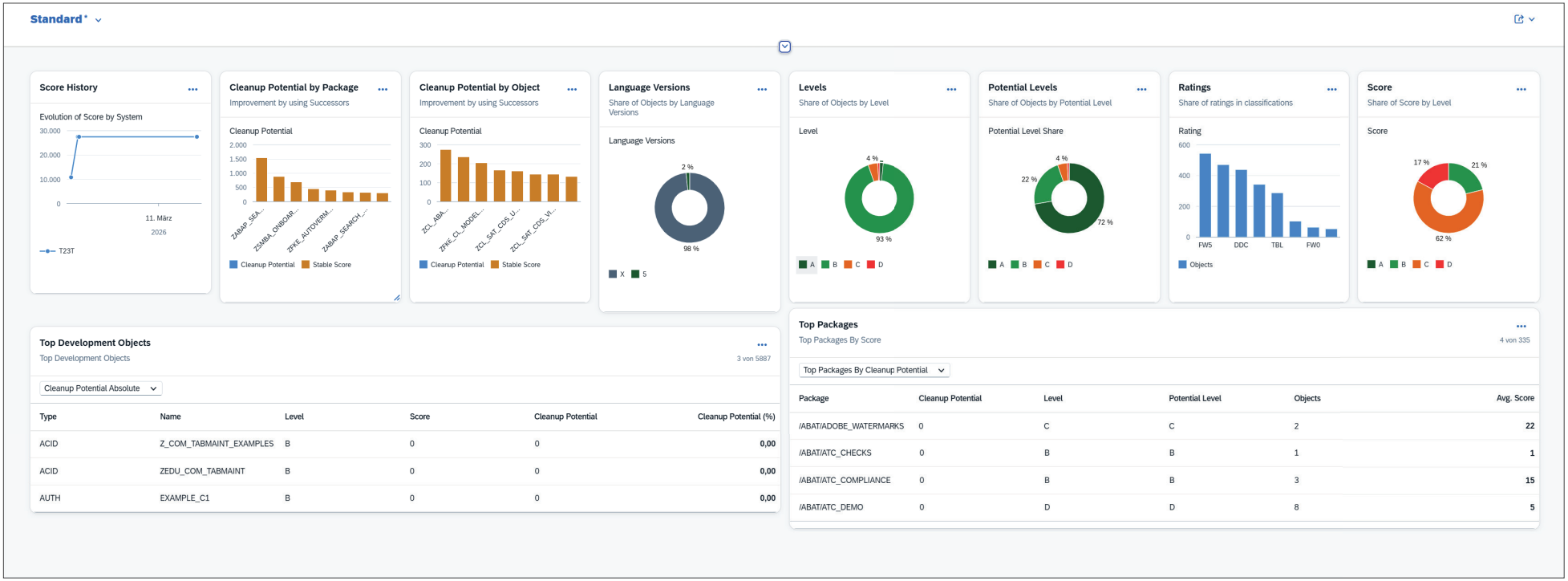

Figure 3 : „Kernseife“ BTP application

Cloudification Repository

The Cloudification Repository is another SAP open-source project that analyzes and evaluates the use of SAP APIs. This assessment uses the catalog of published SAP and partner APIs[4]. It analyzes interfaces accessed by partner and customer systems, verifies their accuracy, and evaluates them.

Code Pal

SAP's Code Pal enables the integration of an extensive collection of ATC checks. These checks provide guidance in accordance with the ABAP Style Guide and thereby support development in line with Clean ABAP[5]. They can be performed locally or as remote checks. They can be run alongside SAP standard checks and complement them.

ABAP Open Checks

ABAP Open Checks is an open-source project not managed by SAP and is a community initiative. Development of the on-premise version continues to be supported. The cloud version was discontinued after a short development period and is no longer being maintained. The Open Checks should be adapted to specific requirements, as the execution of some checks is very runtime-intensive.

[4] vgl. Cloudification Repository Viewer https://sap.github.io/abap-atc-cr-cv-s4hc/
[5] https://github.com/SAP/styleguides/blob/main/clean-abap/CleanABAP.md

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Use Cases

The ATC, as well as the tools and concepts presented, can be used in various application scenarios.

Quality Assurance

Project-specific test cases form the basis for efficient quality assurance. During the development process, developers and reviewers can execute these on an ad hoc basis. They can also be automated as part of the quality gate in the release process or used periodically to build worklists.

Customer-Specific Tests

In systems with a high proportion of customer-specific developments or where customer-specific development guidelines apply, implementing custom tests can be beneficial. These custom tests can be fully integrated into the ATC.

Brownfield Migration

A brownfield migration combined with a simultaneous transition to the Clean Core paradigm forms the basis for a modern, scalable system architecture. SAP's strategic focus is on the cloud as a technology and innovation platform. Many new technologies require a specific Clean Core level.

In complex system landscapes, the compatibility and integration of on-premise ERP systems with cloud-based systems are becoming increasingly important.

Security

Using the CVA makes it possible to analyze a system's security. Potential attack vectors and security vulnerabilities can thus be identified and avoided as early as the development process. The early and reliable resolution of such vulnerabilities is crucial for secure system operation.

Our recommendation

In a distributed system connected to the BTP, a central ATC that includes the CVA without requiring a separate license is recommended. With this setup, the entire system landscape can be managed from the cloud. Using the BTP-ATC offers advantages over an on-premise ATC, as the CVA is available without a separate license and benefits from faster update cycles. The ATC findings can be graphically evaluated in the BTP using modern Fiori applications such as the Custom Code Migration App.

Ideally, a custom check variant with checks from various categories should be created as a standard system check and extended to include customer-specific checks as well as additional checks such as the Code Pal. The check should be performed as part of the quality gate during transport release and used by each developer individually for verification during development. For system landscapes that have evolved over time, a **„Kernseife" check run** should be performed. Recommendations for action regarding the system can be derived from the results. „Kernseife" and cloudification check runs can be performed regularly.

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