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SAP Standard Root Cause Analysis

Whitepaper



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1 Management Summary

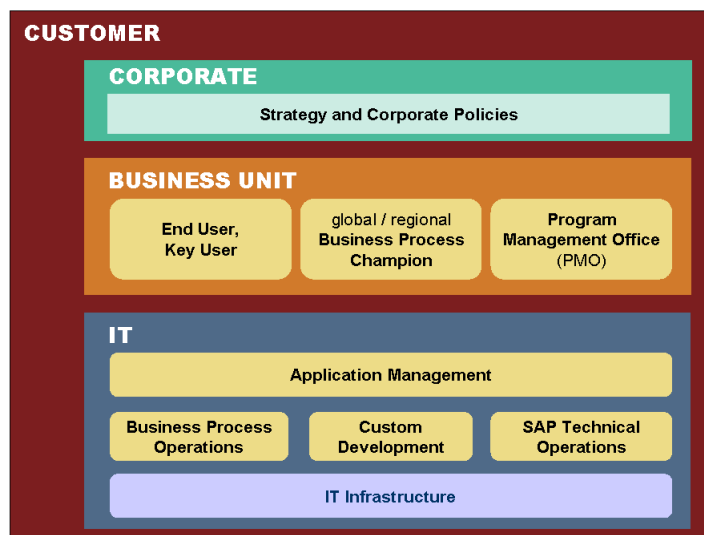
Support of mission critical applications depends strongly on the ability of the SAP ecosystem (customer support, ISV, SAP) to analyze the root cause and provide corrective action for any incident in timely manner. The new root cause analysis paradigm provides a standardized and systematic procedure for root cause analysis, finally pointing to the root cause and hence the usage of a component specific diagnostic tool.

This paper explains the basic concepts as well as the implementation methodology for the standard root cause analysis and finally outlines how to measure the success of the implementation of this standard. This paradigm is used by SAP to identify an area of concern and back up conclusions by evidence.

2 SAP Standards for E2E Solution Operations

Mission-critical operations is a challenge. While the flexibility of SAP-centric solutions rises, customers have to manage complexity, risks, costs, as well as skills and resources efficiently. Customers have to run and incrementally improve the IT solution to ensure stable operation of the solution landscape. This includes the management of availability, performance, process and data transparency, data consistency, IT process compliance, and other tasks.

Typically, multiple teams in the customer organization are involved in the fulfillment of these requirements. They belong to the key organizational areas Business Unit and IT. While the names of the organizations may differ from company to company, their function is roughly the same. They run their activities in accordance with the corporate strategy, corporate policies (for example, corporate governance, compliance and security), and the goals of their organizations.



The different teams specialize in the execution of certain tasks: On the business side, **end users** use the implemented functionality to run their daily business. **Key users** provide first-level support for their colleagues. **Business process champions** define how business processes are to be executed. A **program management office** communicates these requirements to the IT organization, decides on the financing of development and operations, and ensures that the requirements are implemented.

On the technical side, the **application management** team is in direct contact with the business units. It is responsible for implementing the business requirements and providing support for end users. **Business process operations** covers the monitoring and support of the business applications, their integration, and the automation of jobs. **Custom development** takes care of adjusting the solution to customer-specific requirements and developments. **SAP technical operations** is responsible for the general administration of systems and de-

tailed system diagnostics. And the **IT infrastructure** organization provides the underlying IT infrastructure (network, databases, ...). Further specialization is possible within these organizations as well. For example, there may be individual experts for different applications within SAP technical operations.

Efficient collaboration between these teams is required to optimize the operation of SAP-centric solutions. This becomes even more important if customers engage service providers to execute some of the tasks or even complete processes. Customers have to closely integrate the providers of outtasking and outsourcing services into the operation of their solutions.

Key prerequisite for efficient collaboration of the involved groups is the clear definition of processes, responsibilities, service level agreements (SLAs), and key performance indicators (KPIs) to measure the fulfillment of the service levels. Based on the experiences gained by SAP Active Global Support while serving more than 36,000 customers, SAP has defined process standards and best practices, which help customers to set up and run End-to-End (E2E) Solution Operations for their SAP-centric solutions. This covers not only applications from SAP but also applications from ISVs, OEMs, and custom code applications integrated into the customer solution.

There are 16 standards for solution operations defined by SAP:

- **Incident Management** describes the process of incident resolution
- **Exception Handling** explains how to define a model and procedures to manage exceptions and error situations during daily business operations
- **Data Integrity** avoids data inconsistencies in end-to-end solution landscapes
- **Change Request Management** enables efficient and punctual implementation of changes with minimal risks
- **Upgrade** guides customers and technology partners through upgrade projects
- **eSOA Readiness** covers both technical and organizational readiness for enterprise service-oriented architectures (eSOA)
- **Root Cause Analysis** defines how to perform root cause analysis end-to-end across different support levels and different technologies
- **Change Control Management** covers the deployment and the analysis of changes
- **Minimum Documentation** defines the required documentation and reporting regarding the customer solution
- **Remote Supportability** contains five basic requirements that have to be met to optimize the supportability of customer solutions
- **Business Process and Interface Monitoring** describes the monitoring and supervision of the mission critical business processes
- **Data Volume Management** defines how to manage data growth
- **Job Scheduling Management** explains how to manage the planning, scheduling, and monitoring of background jobs



- **Transactional Consistency** safeguards data synchronization across applications in distributed system landscapes
- **System Administration** describes how to administer SAP technology in order to run a customer solution efficiently
- **System Monitoring** covers monitoring and reporting of the technical status of IT solutions

Out of this list, this white paper describes the root cause analysis standard.

3 Root Cause Analysis Standard at a Glance

3.1 Challenge

In today's distributed, multi-technology customer solutions with multi-channel access through diverse devices and client applications, analyzing the root cause of an incident requires a systematic top down approach to finally pinpoint to the root cause of an incident.

For instance, if an end user experiences a performance problem in his browser, the performance hit might be in the client, in the network or somewhere in the server environment, which itself comprises of different instances of different technologies. Server side processing might happen in an SAP Enterprise Portal (based on Java technology), then reach out to an SAP ECC backend (based on ABAP technology) and finally call the database and the storage subsystem for data retrieval. A performance problem or functional defect might occur at one or all stages of this roundtrip launched by the end user from the browser. The E2E root cause analysis tools help identify the specific component which causes high performance bottleneck.

3.2 Goal

The standard root cause analysis offers systematic analysis and resolution of incidents for a distributed mission critical customer environment. Identifying and providing

- an immediate corrective action (workaround) to restore service operations as quickly as possible with minimal disruption to end users by isolating the area of concern
- a complete solution to the issue at hand

Operationally, root cause analysis tools are designed to work towards reducing the number of resources in each step of the resolution process. A small team of support consultants with technical core competence in root cause analysis and a specific component expert who can delve deep into the component is enough to drive the issue and nail it down to a component

Additionally, the root cause analysis infrastructure is open for fast track integration of new SAP technologies, applications and also for third-party software.

3.3 Scope

Root cause analysis provides

- Roadmaps for systematic top down analysis
- One common diagnostic tool for each task in cross-component and component-specific analysis. All tools are safe: they do not allow changes when used by SAP employees unless explicitly requested by the customer and enforced by the customer

change management process. Example, viewing both logs and traces using log viewer.

- An open diagnostics infrastructure with hubs for all different types of diagnostics data (workload, exceptions, technical configuration, traces, proving changes, client diagnostics), allowing basic supportability coverage within a one week integration project. SAP progressively adds not only new SAP technologies, applications and OEM's into this open infrastructure, but also integrates all external software providers (ISV's) for which SAP holds a maintenance contract with customers.
- Training and certification for root cause analysis technical core competence
- Knowledge transfer for experts in component diagnostics (e.g. Web AS ABAP, WebAS Java, Business Intelligence, Exchange Infrastructure, Enterprise Portal, ECC, CRM, databases, SAP client diagnostics, ...)

3.4 Benefits

Ensures continuous business availability

- The major benefit of the root cause analysis standard is the acceleration of problem resolution, which leads to increased availability of the IT solution

Timely go-live of projects

- Enables that project to go live in time and within a stipulated budget.

Reduce costs for support experts

- The targeted top down approach of root cause analysis allows one-step dispatching to the expert in root cause analysis. This approach reduces problem-resolution time and the number of resources involved in the root cause analysis process.
- Progressive data aggregation and the deliberate selection of data from components as well as unified diagnostics data display across applications and technologies drastically reduces the level of specialized skills required for isolation of the problematic component. You don't need to be an all-around component diagnostics expert to identify problematic components.
- Standardization and certification keep consultant's daily rates at an acceptable level.

Reduce license costs

- All tools which perform root cause analysis for SAP standard products are included as a part of the standard maintenance contract.
- SAP Solution Support Enablement pack is provided to customers at a competitive price as compared to other listed prices for such tools in the market, in order for our customers to support their programs and specific environments as SAP does.



Appropriate tools available for root cause analysis off-the-shelf

- The customer can save time in projects and operations to identify proper tools for root cause analysis.
- SAP provides data extraction into SAP Solution Manager and user interfaces for all root cause analysis tools shipped preconfigured for SAP solutions. The customer does not need to develop tools and frameworks for root cause analysis of their own.

Data foundation for monitoring and IT reporting

- The implementation of root cause analysis forms the data foundation for SAP technology and application monitoring. Its foundation also spans across to automated IT reporting.
- Separate standards for system monitoring and business process monitoring enable customers to set automated notification of alerts, and also aid in reducing human administrative efforts to complete mundane IT tasks. Its features include automated report generation and its broadcasting to key people in IT.

All these benefits work towards ease of problem resolution within an IT organization and further reducing cost of ownership.

4 What is the Basic Concept of the Root Cause Analysis Standard?

4.1 Process Flow

4.1.1 How is Root Cause Analysis triggered?

Root cause analysis is either triggered by incident management or solution monitoring (system monitoring or business process monitoring).

Trigger by Incident Management

When an IT problem is experienced, it can be recorded, categorized, and prioritized in the SAP Solution Manager *service desk* by an end user or an IT employee. This message is sent to first-level support, which attempts to clarify the problem, searches customer's solution database and the SAP Notes database. When the solution is not found, application management (second-level customer support) thereafter begins by carrying out a root cause analysis.

Trigger by Solution Monitoring

SAP provides monitoring to both SAP technical operations team (described in standard system monitoring) and the business process operations team (described in standard business process and interface monitoring). Their sole aim is to proactively detect errors and performance bottlenecks before they affect the continuity of the business. Alerts are triggered, based on thresholds in an alert definition and notifies the appropriate IT team responsible for the system.

The scope of solution monitoring is proactive detection of incidents while root cause analysis aims at incident resolution. For example, a memory intensive activity on a specific system is alerted by the system monitor. The cause of such unusual memory growth is not clear unless its root cause analysis points to a memory leak in a custom developed program.

4.1.2 End-to-End Root Cause Analysis

When the help desk within the business unit cannot solve an incident, the application management organization performs E2E root cause analysis in order to isolate the component responsible for a functional defect or a performance problem: client, network, various SAP systems (such as SAP NetWeaver Portal, SAP CRM and SAP ECC) database or storage.

SAP Solution Manager supports E2E root cause analysis to identify the component that is responsible for the error. This top down approach systematically helps you target the cause of the error and thereby avoid having to perform an untargeted, intuition based approach using various component experts. The latter method involves much more time and expense.

You can envision the E2E root cause analysis approach as a type of SAP “criminal investigation” systematically leading to the solution.

4.1.3 Component Root Cause Analysis

Once the application management team has performed E2E root cause analysis and has identified the problematic component, incident management allows forwarding the issue to the right expert in custom development, business process operations, SAP technical operations or IT infrastructure.

Various tools are needed to complete the different tasks in component root cause analysis. In a distributed customer solution, these tools may be located on different systems. SAP Solution Manager provides a **central access point** to the system landscapes and easy access to the required tools.

4.1.4 Analysis through Software Vendor (SAP or Partner)

Even though pre-work and E2E root cause analysis of an issue should be performed by every customer, many customer’s IT organizations are not able to resolve all problems themselves as it requires in-depth knowledge of specific SAP components. SAP or partners might have to engage themselves as needed. In order for these experts to be able to provide efficient support, they need access to the customer’s IT solution landscape. The **remote supportability** standard (see separate whitepaper) describes the following:

- How customers can provide **remote access** to the required tools? In addition to that, customers can provide access to related data required to solve an issue to external experts . This accelerates the delivery of support services and reduces costs. SAP provides all tools required to perform E2E root cause analysis to customers, partners, ISVs and SAP. ISVs and SAP can access these tools remotely and safely through a secured connection to the customer.
- How SAP ensures that the risk of uncontrolled or even inadvertent changes to the productive environment is reduced? This is achieved by read-only authorization policies of the individual root cause analysis applications. Access to productive servers on the operating system level should only be required in exceptional situations. Such system access can be avoided by continuously collecting operating system statistics in the SAP Solution Manager and by using the operating system (OS) command console which allows read-only execution of OS commands. These OS level tools are also instrumental for customer’s application management team as their IT infrastructure team often does not allow OS access to their productive servers.

4.2 Architecture

E2E root cause analysis in SAP Solution Manager is based on a central diagnostics database that is populated with data by a diagnostics agent running on each satellite system. These agents are preconfigured and delivered by SAP, wherein the data required to isolate the problematic component is obtained from the component systems. They continuously collect



exceptions (such as critical log entries, dumps, queue errors), configuration snapshots, workload data including operating system and database statistics from each satellite system. The information is kept uniform across all stacks and is available from one central console in SAP Solution Manager.

E2E diagnostics can support root cause analysis for components implemented in ABAP, Java, C(++), or that run on the Microsoft .NET framework. Here, E2E root cause analysis in SAP Solution Manager standardizes and systematically aggregates

- Performance and resource metrics
- Access to technical configuration
- Exceptions such as logs and dumps (program terminations)
- Traces (recording the activity of a single user or process)
- Tracking changes to software (code), configuration, or content

The cross component diagnostics and component diagnostics tools can be centrally accessed from SAP Solution Manager. These tools can be invoked from any SAP workplace when customers open an SAP connection, thus allowing customers and partners to use the same standardized SAP tools such as primary support and development support. SAP Solution Manager's standard role assignment gives SAP employees only read access to diagnostic data in SAP Solution Manager and the satellite systems. SAP recommends creating the user SAPSUPPORT based on this standard role. This configuration step in SAP Solution Manager can be highly automated using the diagnostics setup wizard, as is the case for all other configuration steps in E2E diagnostics.

Furthermore, the information is condensed, correlated and aggregated and made available for comprehensive IT reporting. Exceptions are reflected in unified statistics of high severity log entries and dumps. From there, it is possible to access component specific log and dump viewers. Technical configuration such as system properties and snapshots of technical configuration are tracked daily to detect inconsistencies between the development, quality assurance and production environments, and to detect any recent changes that may have been applied to the technical configuration of the production landscape.

E2E diagnostics is an infrastructure with open diagnostics data hubs for integrating non-SAP components in short time. The openness of E2E diagnostics is particularly underscored by the integration of third-party product licenses, which is why an Introscope license from CA's Wily Tech Division is made available along with E2E diagnostics. Introscope uses byte code instrumentation (BCI) technology which allows you to collect and integrate performance statistics at the code level for Java and .NET components without having to access the source code. DiagnosticsSolution Manager comes with an Introscope license for instrumentation and *dashboards*, delivered by SAP. Therefore, you can collect performance statistics for non-ABAP-based components and integrate them in E2E diagnostics. Data collected by Introscope is not only analyzed by root cause analysis tools, but also by solution monitoring.

Solution monitoring in SAP Solution Manager is built on cross component diagnostics data and encompasses automated function tests, health checks, as well as an IT reporting solution.



Health checks in SAP Solution Manager continuously monitor critical states of the connected systems and assess them using a traffic light approach. One such example of a health check is *system monitoring*. In addition to online monitors, you can send messages to configurable email or SMS addresses via alert management if critical system states are reached.

If your company has become accustomed to products from other manufacturers for system monitoring, you can access data and alerts in the SAP Solution Manager's monitoring infrastructure and direct this information to the respective third-party system monitoring infrastructures.

IT reporting offers web reports based on *SAP NetWeaver Business Intelligence* (SAP NetWeaver BI). You can generate documents used for regular submissions to defined persons within the scope of your IT reporting process. SAP EarlyWatch Alert is one such example of an automatically generated IT report, which is used periodically to provide information on the quality of operations in a standardized SAP format. The report includes capacity trends, typical key performance indicators (KPIs) for service level monitoring, response times, and quality indicators for functional *change management*. If the report indicates a "red light," it is forwarded to SAP's support backend infrastructure and SAP Active Global Support analyzes how the customer can be supported in order to alleviate the critical system status.

SAP Solution Manager's IT reporting function also offers customer-designed reports such as BI-based web reports and document generation for Service Level Reporting, in addition to the standardized and scheduled SAP EarlyWatch Alert IT report.



5 How to Implement the Root Cause Analysis Standard?

5.1 Methodology

To implement E2E diagnostics in your IT organization, the central diagnostics infrastructure must be set up and appropriate knowledge transfer to application management, custom development, business process operations and sap technical operations has to be imparted highlighting the usage of the tool.

5.1.1 Diagnostics Setup

While the Component specific root cause analysis tools do not have specific prerequisites the E2E root cause analysis capabilities require installation and configuration steps in SAP Solution Manager that are described in the IMG in SAP Solution Manager (transaction SPRO).

Alternatively SAP offers services such as the SAP Solution Manager Starter Pack for setup and initial knowledge transfer.

Service Prerequisites:

1. The SAP Solution Manager 4.0 SP10 or higher must be installed, with a UNICODE enabled dual stack of WebAS ABAP and WebAS Java.
2. The SAP Solution Manager system and all relevant satellite systems in your system landscape must be prepared according to the section technical requirements in the SAP Solution Manager IMG.
3. A remote connection to SAP for the SAP Solution Manager exists

To support the on-site delivery of this service, a project room is recommended that would serve as the hub for the technical implementation activities, and as a meeting point for all members. Training and workshops are facilitated more effectively if they take place in a classroom environment at the customer site.

Service Delivery Type:

The SAP Solution Manager Starter Pack is delivered on-site by certified partners or SAP consultants. It has a normal duration of two days. On the first day, consultants work together with your system administrators to set up and test the SAP Solution Manager or to configure diagnostics. The second day is reserved for on the job training. The goal of the starter pack is to teach the customer in configuration and administration of Diagnostics.



You can order the SAP Solution Manager Starter Pack in the SAP Service Marketplace at <http://service.sap.com/servicecatalog>. A convenient delivery date is scheduled with you. For more details about the Solution Manager Starter Pack, visit <http://service.sap.com/diagnostics>.

Regardless if the customer or SAP is setting up diagnostics, the following steps need to be conducted for the setup of diagnostics:

Implementation Step	To be performed on	How often?
Step1: Implement diagnostics server on SAP Solution Manager	SAP Solution Manager	Once for the customer solution landscape
Step 2: Installing agents	Managed systems	Once per satellite, if the satellite release is lower than NW04s SR3
Step3: Configuring the agents on the satellites	SAP Solution Manager	Either for each satellite or for a set of satellites

Details about Step 1: Implement diagnostics server on SAP Solution Manager

Action on SAP Solution Manager	Remarks
Deploy diagnostics server on Web AS Java	
Run Diagnostic Setup Wizard	
Install Wily Introscope Enterprise Manager	
Install Mercury Load Generator	Optional, only relevant if customer wants a GoingLive Check Optimization session for an Enterprise Portal
Configure remote connection to SAP Support	
Configure EarlyWatch Alert	
Create diagnostics administration user	Optional, but recommended

Details about Step 2: Installing agents

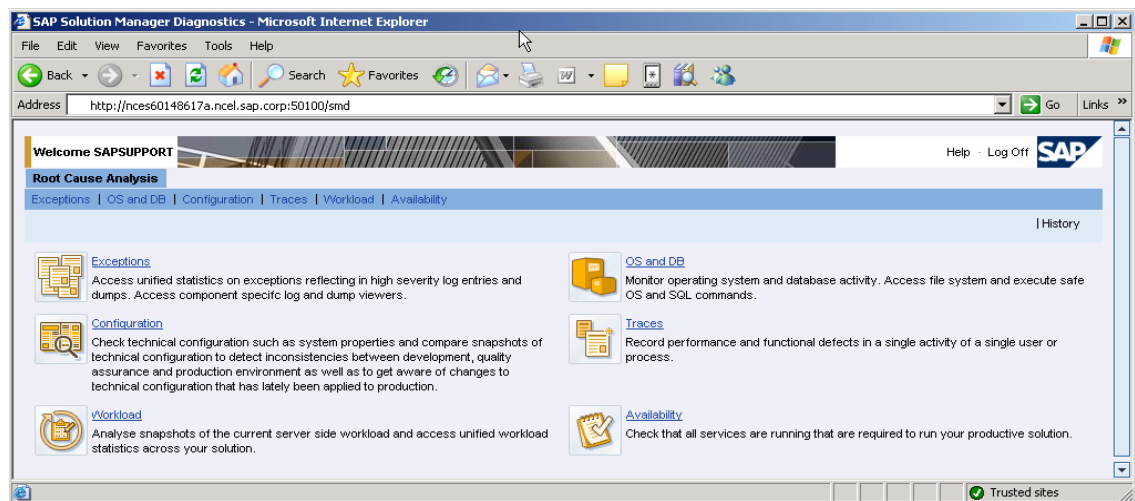
Action on Satellite	Remarks
Install diagnostics agent (sapinst)	
Create diagnostics user for Web AS Java on satellite	Only if managed system is using local ABAP user store

Details about Step 3: Configuring the agents on the satellites

Action on SAP Solution Manager	Remarks
Define landscape in SMSY	If the System Landscape Directory sends component and version information automatically, only the assignment of components to solutions needs to be carried out
Run managed system wizard	

5.2 Tools

Diagnostics is a web enabled console which comprises the six sections **exceptions, configuration, workload, OS and DB, traces, and availability**.



The sections exceptions, configuration, workload, availability, and traces include an E2E root cause analysis capability:

E2E exception analysis (as of SAP Solution Manager 4.0 SP10) provides unified access to exceptions reflecting in high severity log entries and dumps. Component specific log and dump viewers can be accessed directly from the E2E exception analysis.

E2E workload analysis (as of SAP Solution Manager 4.0 SP10) provides unified access to server side workload statistics.

E2E trace analysis (as of SAP Solution Manager 4.0 SP10) records performance and functional defects in a single activity of a single user or process, from browser to disk. The measurement is started at the user interface of the end user and the trace level for the roundtrip is

selected. When the request hits the downstream servers, all components switch their traces on resp. change the log level according the selected trace level.

E2E change analysis (as of SAP Solution Manager 4.0 SP13) provides transparency on changes (code, business configuration, content) that were lately applied to production. This analysis is particularly instrumental if a few ad-hoc changes were applied to a production that result in disruptions after applying these changes.

E2E availability analysis (as of SAP Solution Manager 4.0 SP15) outlines all technical services that are not running properly in the customer solution. This analysis is particularly instrumental for the diagnosis of startup problems.

5.3 People

Following SAP's collaboration model between the customer's business unit and customer IT, the application management team is the owner of the E2E root cause analysis process. If required, the other customer IT units such as custom development, business process operations, SAP technical operations and IT infrastructure perform detailed root cause analysis on the component responsible for the incident and then apply the corrective actions.

The E2E Solution Operations Curriculum helps customers to educate the specialized teams and stakeholders to execute efficiently the tasks assigned to the different groups. The individuals can learn about SAP standards describing best practices to use the tools and services and how to collaborate between the different roles. The E2E Solution Operations Curriculum is structured along different knowledge levels as follows:

E2E Solution Operations - Overview E-Learning E2E50:

These e-learnings provide an overview of E2E Solution Operations. The target groups are all teams and stakeholders involved in E2E Solution Operations.

Technical Core Competence Courses:

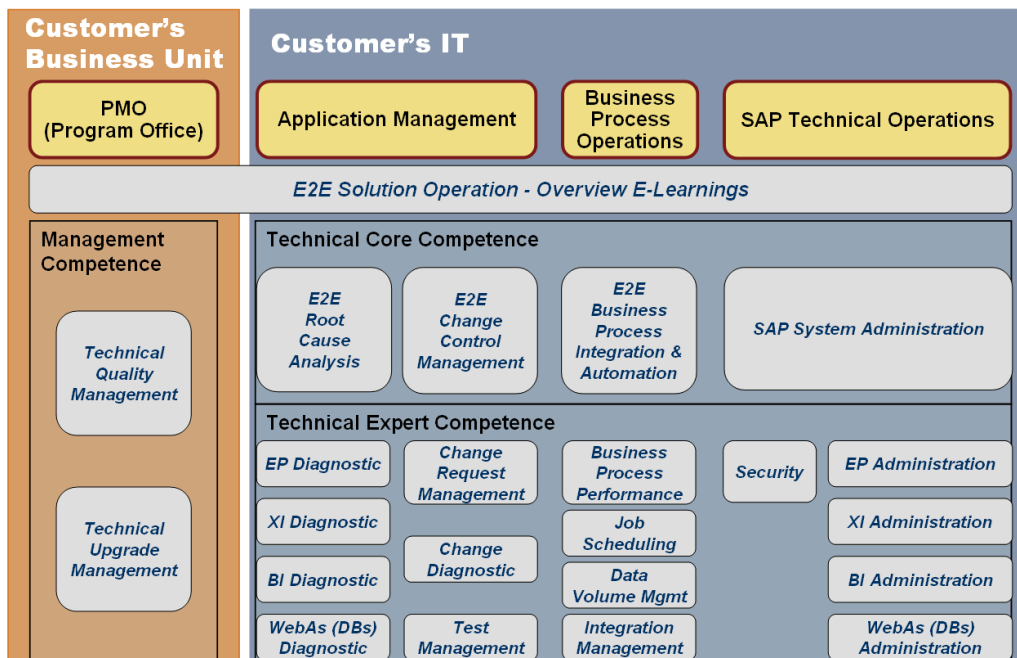
These courses provide core knowledge explaining basic tasks for solution operations. They consist of several system demos and exercises for regular tasks. The target groups are application management, SAP technical operations, business process operations and custom development team members.

Technical Expert Competence Courses or Workshops:

These courses provide a deep level of knowledge explaining basic & specialized tasks for solution operation. The course consist of several system demos and exercises for regular and specialized tasks. The workshops are service oriented. They are performed individually for one customer and use the customer system for the exercises. The target groups are members of center of expertise groups specialized on critical technical components (e.g. EP, XI, BI, and Database).

Management Competence courses:

These courses provide a technical management knowledge explaining E2E Solution Operations standards including the roadmap on how to implement the SAP standards which incorporate people, processes and platform. The courses also describe the critical success factors for E2E Solution Operations and the potential tasks for outsourcing or out-tasking. The target groups are IT leads, program managers, and business process champions. The overall education course portfolio is shown in the below figure.



For root cause analysis core competence, SAP offers the the course **E2E100 - E2E Root Cause Analysis**. It covers the tools and approaches for analyzing the root cause of incidents and isolate the component causing the incident in a heterogeneous IT landscape. Prerequisites for this course include an overview of SAP Technology as well as basic understanding of SAP Solution Manager. Understanding of E2E Solution Support basic concepts as taught in the e-learning E2E50 is helpful to put root cause analysis in perspective to the other solution operations areas change control, business integration and automation, and upgrades/eSOA readiness.

E2E100 is a five day course ending with a certification exam in the afternoon of the fifth day. Upon successful completion of this certification, the participant receives the certificate 'Application Management Expert – Root Cause Analysis'. The certification tests the knowledge in the area of the E2E root cause analysis. This certificate proves that the candidate has a basic understanding within this profile, and can implement this knowledge practically in E2E solution operations. The certification test consists of questions from the areas specified below (weight in certification provided in percent):

1. Introduction to E2E Root Cause Analysis (5%)

- Why E2E root cause analysis?
- Cross component diagnostics vs. component diagnostics
- Root cause analysis vs. solution monitoring
- SAP Solution Manager as key enabler for E2E root cause analysis
- Savings through E2E diagnostics in SAP Solution Manager
- Incident management and pre-clarification

2. E2E Change Analysis (10%)

- How to collect end to end version information from customer landscape
- How to detect changes to production
- Architecture of One Transport Order

3. E2E Workload Analysis (30%)

- How to detect a general performance bottleneck on server side
- Comparison of ABAP and Java workload analysis
- Overview on ABAP workload analysis
 - ABAP process overview
 - ABAP performance statistics
- Overview on Java workload analysis
 - Java thread dump analysis
 - Workload analysis with Wily Introscope
 - Java memory analysis
- Overview on operating system and database analysis

4. E2E Trace (30%)

- Recording and analyzing an E2E trace
- Architecture of E2E trace: client to network to server to database to disk
- Comparison of ABAP and Java traces
- BMC AppSight as SAP standard for client side root cause analysis
- Java tracing with Wily Introscope transaction trace
- ABAP tracing with SQL trace (ST05) and application trace (ST12)



5. E2E Exception Analysis (15%)

- Accessing logs and dumps for ABAP and non ABAP environments with E2E exception analysis
- Comparison of ABAP and Java log and dump analysis
- ABAP Syslog and application log
- Java log viewer and Java thread dump analysis

6. Application and Data Inconsistency Analysis (5%)

- Analyzing functional defects with the ABAP debugger
- Understanding the reasons and resolution strategies for data inconsistencies

7. Proving Solution Quality with SAP EarlyWatch Alert (5%)

- Architecture of SAP EarlyWatch Alert for ABAP and Java
- Key performance indicators of a stable SAP Solution
- Understanding SAP EarlyWatch Alert reports



6 How to Measure the Success of the Implementation?

Indicator	Target
Corrective action plan for all priority 1 messages	Available within four hours
Messages to SAP are pre-clarified and results of customer E2E diagnostic described in message text	(Close to) no roundtrips between customer and SAP



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