**L2 ~~or L3~~ or tests name:** IT-Operation Management

**Legal entities in scope:** DBAG, ExR, EFAG, ECAG, CBF, CBL, LuxCSD, CI, CS and CFCL

|  |
| --- |
| Cloud operations |

**[+ including AU-121-11-CSDR CSDR IT-Operation Management]**

**Test(s) according to RCA:**

(TP1) Inquire with relevant personnel about the Cloud Operations area’s defined roles and responsibilities to identify key areas to review.

(TP2) Perform a walkthrough on the Cloud Applications Operation and Cloud Infrastructure Operations processes and their controls

(TP3) Test via a representative sample the controls on maintenance and monitoring established around Cloud Applications Operation and Cloud Infrastructure Operations

(TP4) Validate the monitoring of capacity of cloud applications is performed and escalation mechanisms are established in case if needed.

(TP5) Follow up on the S/4HANA (located in GCP Cloud) incident where the application ran out of memory and was not available for the business.

(TP6) Check whether cloud-related incidents were reported to the regulator in compliance with DORA, during the period under review. (i.e. cloud workloads have adequately been considered in the operational monitoring and incident management processes to allow equally timely handling).

**Audit procedures/source:**

* Information directly requested from auditee (via e-mail or call) or extracted from provided documentation during preparation phase.

**Conclusion:**

Ok, no exception identified

Internal audit (VS, FM) has performed the following Audit procedures:

**-------------------------------------------------------**

**Summary of work done:**

**-------------------------------------------------------**

|  |  |  |
| --- | --- | --- |
| **AP** | **Work done** | **Result** |
| **TP1** | Cloud Application Operations:  IA conducted walkthrough meetings on 19Feb, 21Feb and 28Feb with the Cloud Application Operations (S). During the meetings, IA understood that the team is responsible for operating and maintaining majority of Corporate IT applications, including SAP, SaaS, IT Tools and other cloud-based applications. This section consists of following teams/units: Corp IT Tools, SAP Ops, Corp IT Applications, SaaS Ops.  [Re\_ 2025-001 IT Operation Management\_Discussion on Cloud Operations.msg](https://deutscheboerse.sharepoint.com/:u:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Re_%202025-001%20IT%20Operation%20Management_Discussion%20on%20Cloud%20Operations.msg?csf=1&web=1&e=MOvzU0)  To understand whether specific roles and responsibilities are established for individuals within the team based on their roles, IA reviewed a sample of job descriptions defined for the respective roles.  [Job Description AppOps Head.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Application%20Operations/JD%20%26%20Onboarding%20Template/Job%20Description%20AppOps%20Head.docx?d=w917b7b9bc95845c39e956e544dc9361e&csf=1&web=1&e=M4fj3S)  [Job Description App Ops Engineer.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Application%20Operations/JD%20%26%20Onboarding%20Template/Job%20Description%20App%20Ops%20Engineer.docx?d=wfcf30945195047cd920a7eba955e230a&csf=1&web=1&e=apLQK8)  [Job Description Windows AppOps Engineer.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Application%20Operations/JD%20%26%20Onboarding%20Template/Job%20Description%20Windows%20AppOps%20Engineer.docx?d=wb35d2351fa6146b297355f1833ef15fb&csf=1&web=1&e=Fl0dC6)  [Job Description Automation Engineer Ext.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Application%20Operations/JD%20%26%20Onboarding%20Template/Job%20Description%20Automation%20Engineer%20Ext.docx?d=w12edf592d2314fb1840c0bd63e16747c&csf=1&web=1&e=2Vrij0)  Based on the review of job description documents, IA noted that the roles and responsibilities for monitoring are standardized, regardless of whether the environment is on-premises or cloud-based. IA understands that the responsibilities on monitoring of applications by the team are not differentiated based on where they have been hosted, i.e., on-premises or cloud. Apart from this, IA also noted that standard onboarding procedures are followed to onboard new individuals to the team and bring them up-to-speed with the functions of the unit/section and the roles and responsibilities.  [Onboarding plan template.xlsx](https://deutscheboerse.sharepoint.com/:x:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Application%20Operations/JD%20%26%20Onboarding%20Template/Onboarding%20plan%20template.xlsx?d=we9b4391b00f747f985a4aa23a4dc06f8&csf=1&web=1&e=47eA0Z)  Cloud Infrastructure Operations:  IA also conducted walkthrough meetings on 03Mar with the Cloud Infrastructure Operations (S). During the meetings, IA understood that the team is responsible for managing and maintaining the cloud infrastructure (OS, Databases and Cloud network) and remaining on- premises infrastructure. This section consists of the following teams/units: Unix Server Mgmt, MS Middleware Ops, Windows Server Mgmt.  To understand whether specific roles and responsibilities are established for individuals within the team based on their roles, IA reviewed a sample of job descriptions defined for the respective roles.  [JDs\_MS Middleware.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/JD%20%26%20Onboarding%20Template/Middleware/JDs_MS%20Middleware.docx?d=w1a8fdf4310244ff6b5d4a24ad26227f2&csf=1&web=1&e=TKQ7YH)  [DBA 2025 Unix.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/JD%20%26%20Onboarding%20Template/Unix/DBA%202025%20Unix.docx?d=w669d2b17321a41fe9a641bc86c53f685&csf=1&web=1&e=xh8tLA)  [DBA 2025 Unix.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/JD%20%26%20Onboarding%20Template/Unix/DBA%202025%20Unix.docx?d=w669d2b17321a41fe9a641bc86c53f685&csf=1&web=1&e=xh8tLA)  [JD\_Unix Backend Operations.pdf](https://deutscheboerse.sharepoint.com/:b:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/JD%20%26%20Onboarding%20Template/Unix/JD_Unix%20Backend%20Operations.pdf?csf=1&web=1&e=4BP11K)  Based on the review of job description documents, IA noted that the roles and responsibilities for monitoring are explicitly defined for on-premises and cloud-based environments. IA understands that the responsibilities on monitoring of applications by the team are clearly defined based on where they have been hosted, i.e., on-premises or cloud. Apart from this, IA also noted that standard onboarding procedures are followed to onboard new individuals to the team and bring them up-to-speed with the functions of the unit/section and the roles and responsibilities.  [MS Middleware Operations\_Onboarding plan template.csv](https://deutscheboerse.sharepoint.com/:x:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/JD%20%26%20Onboarding%20Template/Middleware/MS%20Middleware%20Operations_Onboarding%20plan%20template.csv?d=w1388717f312d49d49d8bf9ddc453af1a&csf=1&web=1&e=3JhTXR)  [Onboarding Template\_Unix.xlsx](https://deutscheboerse.sharepoint.com/:x:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/JD%20%26%20Onboarding%20Template/Unix/Onboarding%20Template_Unix.xlsx?d=w6ea1c76d9f314bb385a6de43527cd7b8&csf=1&web=1&e=CZtjTR) | OK, no exceptions noted. |
| **TP2** | IA reviewed the DBG SharePoint portal and understood that Cloud Application Operation is responsible for operating and maintaining more than 150 corporate IT applications, including SAP, SaaS and other cloud-based applications. The section ensures that these applications are available, scalable, and secure.  During the walkthrough meetings, IA understood that key processes handled by this team includes applications operations and maintenance including availability and scalability monitoring. IA further understood that the Cloud Application Operations team adapts the processes established within Corporate IT regarding the IT Operations activities including Incident Management, Problem Management, Change Management and Backup & Retention. These processes incidentally refer to the standard processes defined by the IT Governance, Risk and Transformation. To confirm this, IA reviewed the Corporate IT Incident Management Process and confirmed that it also refers to the centralized Incident Management Process defined at the DBG-level.  [CRP\_Incident\_Management\_Procedure\_2.4.pdf](https://deutscheboerse.sharepoint.com/:b:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Application%20Operations/CRP_Incident_Management_Procedure_2.4.pdf?csf=1&web=1&e=4BwmWA)  IA reviewed the DBG SharePoint portal and understood that Cloud Infrastructure Operations is responsible for managing and maintaining the cloud infrastructure that supports the organization’s IT systems and applications. This includes ensuring the availability, scalability, and security of the cloud infrastructure (OS, Databases and Cloud network) and remaining on- premises infrastructure and monitoring and optimizing its performance. The section also works closely with other teams e.g., Cloud applications operation to ensure that the cloud infrastructure is integrated with other IT systems and applications.  Further, IA reviewed the ​​Windows Infrastructure Monitoring document that defines the processes on how infrastructure (physical, virtual or cloud) operated by Corporate IT Operations – Windows Server Management is monitored using the using Microsoft System Center Operations Manager (SCOM – AID722).  [IT\_CRP\_Windows-Infrastructure\_Monitoring\_1.3.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/IT_CRP_Windows-Infrastructure_Monitoring_1.3.docx?d=wf0423959528a4e8a99d3191960252b0f&csf=1&web=1&e=iiOb0f)  Based on the review, IA noted that the following primary objectives fall under the purview of monitoring:   1. Proactive Monitoring: Detect and address issues before they impact end-users. 2. Performance Optimization: Ensure optimal performance of IT resources. 3. Availability Assurance: Maximize uptime and availability of critical services.     In addition to SCOM, the team uses SquaredUp which is a 3rd party web-based interface extending SCOM capabilities. Manipulation with alerts and other objects and displaying metrics visualisation is intended using the portal by default. SquaredUp, is the tool used to have a graphical view on the different alerts. This includes Dashboard, reports, classification, statistics, views, on all the alerts raised by SCOM.      Furthermore, the OpsGenie tool (AID799) which is a modern SaaS alert and on-call management tool is integrated with SCOM. This ensures to route alerts to respective on-call teams who can set their own escalation and notification alerting policies.    IA also reviewed the ​​SAP – Operations – Manual that describes the duties of the SAP UNIT Operations and internal service within the Company.  [SAP-Operations-Manual\_v4.8 2024.docx](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/Cloud%20Infrastructure%20Operations/SAP-Operations-Manual_v4.8%202024.docx?d=w88a8ae3df7ad41179cc7bcd64c494a74&csf=1&web=1&e=Ekb40x)  Within the scope of the SAP Unit Operations the following functions / roles are perceived:   1. SAP Environment Monitoring (=First level support), 2. the on-call duty (=Admin on Duty) 3. the product responsible and the subject responsible (=Second level support and projects)   which offer 24/7 support for SAP Operations:    IA noted that the following major tasks of monitoring fall under the purview of this team:   * Secure the SAP operations according to the agreed operation levels * Timely recognition of events / incidents and their processing * Acceptance, processing, or tracking of Service Requests * Development and co-operation with realisation of measures to improve Daily Operations * Quality control regarding compliance with defined process and approach. * Procedures & descriptions of tasks * Lead times and processing times * Co-operation in the generation of Reporting & Statistics   All systems hosted on GCP are monitored through their console with information about current and past resources usage.  The OpsGenie tool is used here as well for the purpose of automated alerting notification. Business/Technical Critical events which were found by Solution Manager M72, will simultaneously be forwarded over to the Opsgenie. The SAP solution Manager is used for SAP application alert monitoring including resource utilization, critical OS mount point status, DB memory, buffer utilization, DB backup status etc. | OK, no exceptions noted. |
| **TP3 & TP4** | To understand how monitoring of applications and their supporting infrastructure is handled also in consideration of measures already implemented regarding the timeliness of reporting from DORA side, IA selected the following sample applications and production servers and evaluated the monitoring and alerts generated during such monitoring and alerts/notifications processes for the months of April and August & October 2024:   |  |  |  | | --- | --- | --- | | AID | Application Name | Server Name | | [AID2176](#Daisy) | DAISY – AI Platform | CRPGCDDAISY01 | | [AID968](#SMS) | Security Management System (SMS) | GCPSMSEBI11A GCPSMSDVM11B | | [AID527](#BusinessJIRA) | Business Apps Jira Platform | CRPGCPBSNJIRA01 | | [AID489](#S4HANA) | SAP S/4HANA | FRPOTIC02 | | [AID413](#JIRA) | JIRA | CRPGCSJIRADBG02 |   The applications sampled above were selected based on the following criteria:   * Applications in Cloud * Overall criticality rating of the application – Critical & Major * Applications supported by CRP SAP and CRP Non-SAP teams * Application self-deployed and Commercial-off-the-shelf Solution * Applications with RPO less than 4 hours  1. DAISY – AI Platform (AID2176):   Capacity Monitoring via CheckMK used for Monitoring of system and application events  A screenshot of a computer  AI-generated content may be incorrect.      Note: Application Daisy did not exist in April.  [Back to the top of TP3 & TP4](#TP3TP4)   1. Security Management System (AID968):   SCOM Alerts & Monitoring  A screenshot of a computer  AI-generated content may be incorrect.  A screenshot of a computer  AI-generated content may be incorrect.  CPU information  A screenshot of a computer  AI-generated content may be incorrect.  A screenshot of a computer  AI-generated content may be incorrect.  CPU information      Memory information    System uptime    [Back to the top of TP3 & TP4](#TP3TP4)   1. Business Apps Jira Platform (AID527)   Capacity Monitoring via CheckMK used for Monitoring of system and application events  A screenshot of a computer  AI-generated content may be incorrect.  A screenshot of a computer  AI-generated content may be incorrect.      [Back to the top of TP3 & TP4](#TP3TP4)   1. SAP S/4HANA (AID489):   SCOM Alerts & Monitoring        image.png  CPU information  A screen shot of a computer  AI-generated content may be incorrect.  A screen shot of a computer  AI-generated content may be incorrect.  Memory information  A screen shot of a computer  AI-generated content may be incorrect.  A screen shot of a graph  AI-generated content may be incorrect.  System uptime  A screen shot of a computer  AI-generated content may be incorrect.  A screen shot of a computer  AI-generated content may be incorrect. [Back to the top of TP3 & TP4](#TP3TP4)   1. JIRA (AID413)   Alerts          CheckMK monitoring      [Back to the top of TP3 & TP4](#TP3TP4)  Based on evaluation of the above monitoring and alerting/notification processes in place, IA confirmed that the controls on monitoring of applications and their supporting infrastructure for the sampled applications and productions servers (and sampled months), were working effectively.  In addition to the above, IA also understood that Cloud Operations KPI reporting are part of the Corporate IT KPI reporting which provides an overview of IT Business Processes and End user Workplace. The KPI reporting requirements and parameters are recorded within the SPICE tool on a frequency based on the SDS agreements between DBAG Corporate IT and the respective LEs within the group. In that perspective, IA performed a review of two sample months of April and August 2024 and confirmed that the KPs reported did not breach the target KPI measurements.    [KPI Reporting IT Operations Audit.xlsx](https://deutscheboerse.sharepoint.com/:x:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/Cloud%20operations/Evidences/KPI%20Reporting%20IT%20Operations%20Audit.xlsx?d=wa766a07d20ec40c29846dcad678a0057&csf=1&web=1&e=YewY6g) | OK, no exceptions noted. |
| **TP5** | Please refer to TP3 within the [L2 process IT-Operation Management](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/IT%20Operations%20Management/WP%20-%20IT%20Operations%20Management.docx?d=w34e374e66c104c66b0251edfe98c3ac2&csf=1&web=1&e=dZtID6) for more information on the S/4HANA incident. | OK, no exceptions noted. |
| **TP6** | Please refer to TP3 within the [L2 process IT-Operation Management](https://deutscheboerse.sharepoint.com/:w:/r/sites/sp0281/internal/2025%20Audits/2025-001%20IT%20Operation%20Management%20(DBAG,%20ECAG,%20CBL,%20CBF,%20CFCL)/06%20Fieldwork/IT%20Operations%20Management/WP%20-%20IT%20Operations%20Management.docx?d=w34e374e66c104c66b0251edfe98c3ac2&csf=1&web=1&e=dZtID6) for more information on the cloud-related incidents that were reported to the regulator in compliance with DORA. | OK, no exceptions noted. |

Caveat: All notes in this document do not represent a protocolary transcript or quotations of the meetings. They rather provide an overview over the content of the meeting. Further the notes may be arranged according to the topics discussed and not based on the chronological course of the meeting.