

Reinvent the wheel with SAP S/4 HANA security

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Agenda

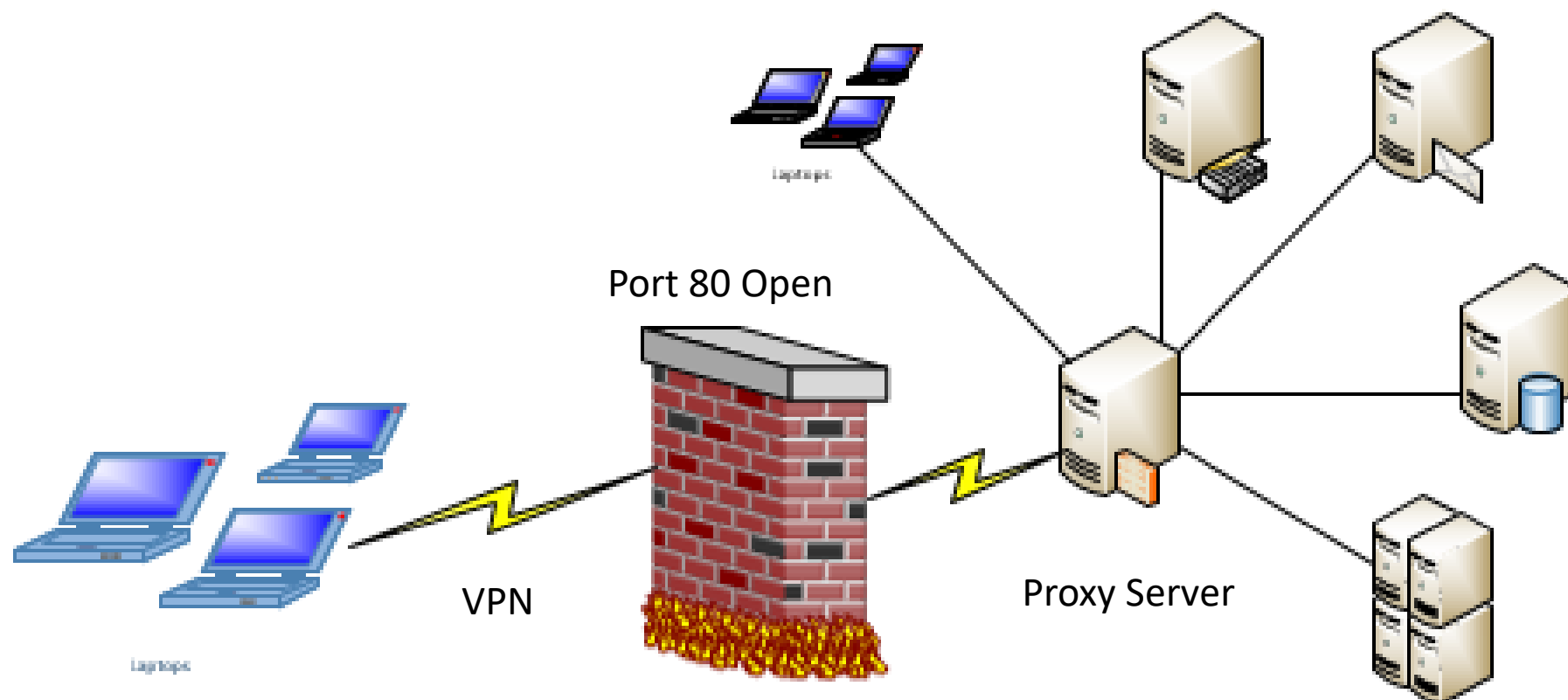
Data Center Risk Profile Comparison

SAP Cyber Risks

Infrastructure Risks

S/4HANA Security Planning

On Premise Datacenters



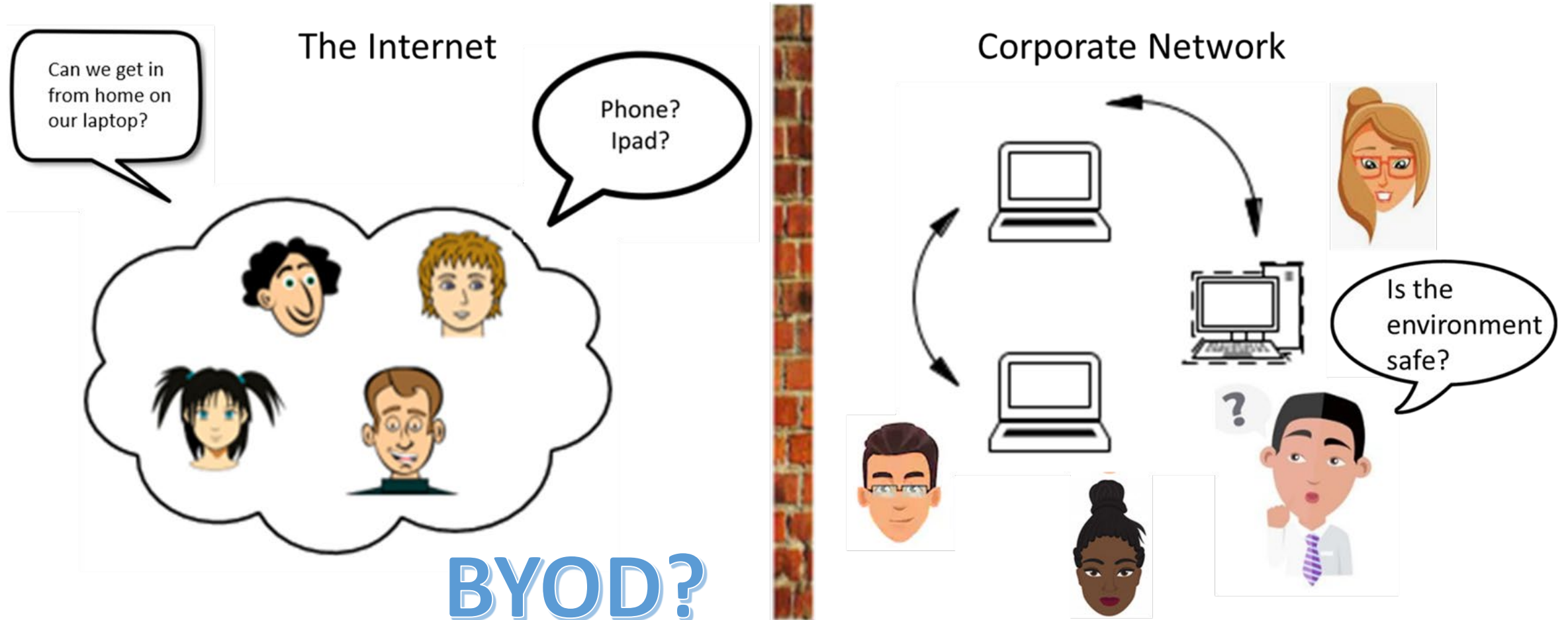
Prior to server hosting, PAAS, SAAS, etc., many datacenters were open networks internally. No segmentation or server connection restrictions and minimal ports open through the firewall. Any user connected must operate on a VPN or Citrix server.

On-Prem Systems

- Cybersecurity Risks
 - Yearly Software Updates?
 - Monthly/Periodic Security Patches?
 - Custom Modification Code Review?
 - Open Network?
 - RFC Access?
-
- It does what we need
 - “If it isn't broke, don't fix it”



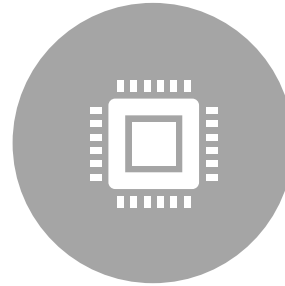
On Prem before the Pandemic



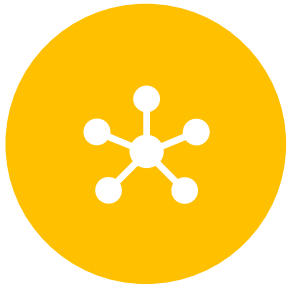
Where We Were



On Premise Datacenter



Firewall with limited
ports open



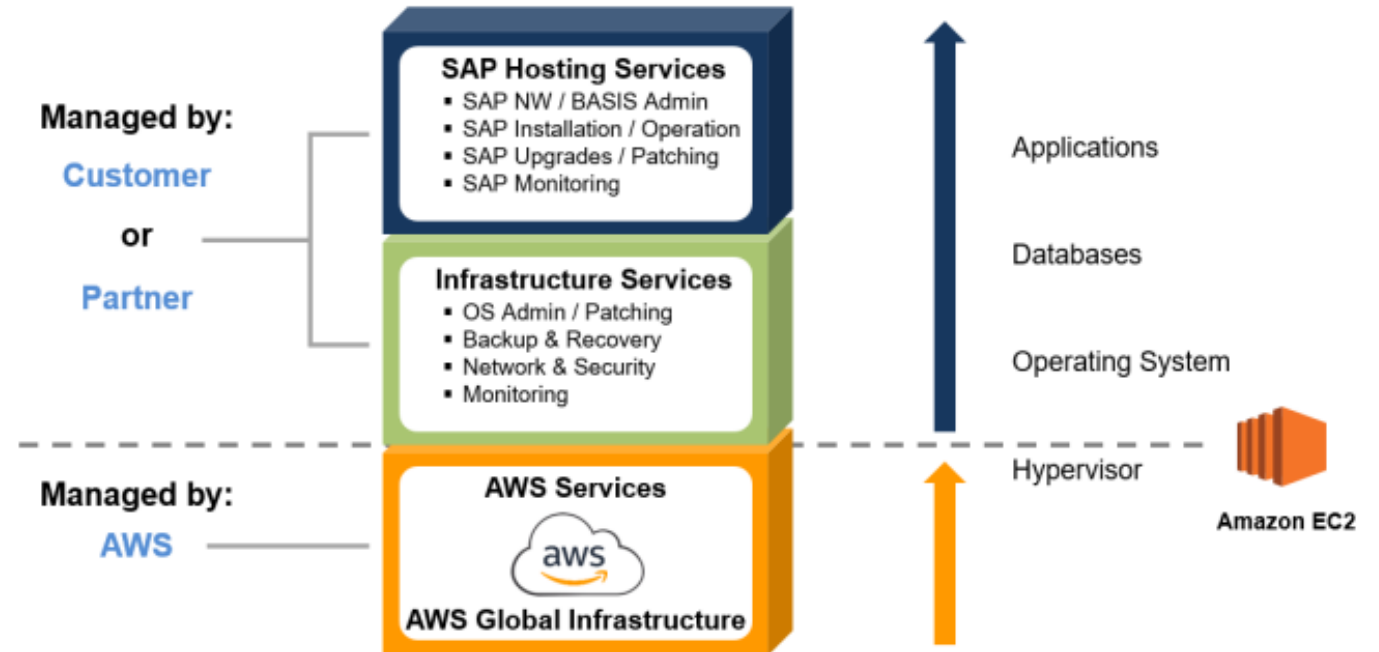
Open internal networks



Standalone ERP system
with limited external
integration

Managing Platform Risks

- Moving from a private datacenter to a private cloud provider, many customers have reduced risk since companies like AWS apply platform patches at least monthly.
- Ownership of risks above the platform such as Linux O/S, HANA DB and S/4HANA remain the customers responsibility.



SAP Cyber Risks



SAP Cyber Risks Are Real

hacking sap

ALLWORK

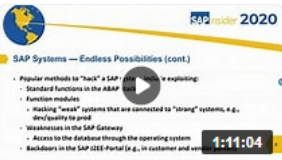
1,770,000,000 Results

sap password cracking


ALLWORKIMAGES

1,030,000,000 ResultsAny

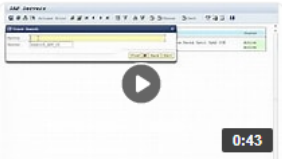
Videos of Hacking SAP
bing.com/videos




SAP Hacking - Let Google hack your **SAP** System 2.0
2.2K views · Mar 30, 2020
YouTube > Xiting



5 ways to hack your **SAP** system | Virtual Forge...
2.8K views · Sep 22, 2017
YouTube > Virtual Forge a...



Hacking SAP with SM51 and executing OS command
15K views · May 23, 2012
YouTube > erpsan



HACKING KIIT SAP LOGIN AND PASSWORD (FOR K...
2.4K views · Jul 3, 2019
YouTube > Praddyum Verma

See more videos >

SAP Password Cracking with John the Ripper - Matt Bartlett

www.mattbartlett.co.uk > [sap-password-cracking-with-john-the-ripper](#) ▼

Jul 07, 2019 · Step 1: Dump the **password** hashes from SAP. You can use this ABAP Program to generate in the correct format for John the... Step 2: Download and Install John the **Ripper**. In the video I optionally compile for my Linux Backtrack Server and enable... Step 3: Simply run John ...

Estimated Reading Time: 2 mins

SAP password hacking Part I: SAP BCODE hash hacking

<https://www.saptechnicalguru.com> > [sap-password-hacking-bcode](#) ▼

SAP password hashes. **SAP** has 3 main **password** hashes: **SAP BCODE** (oldest one and very weak): not to be used any more. **SAP PASSCODE** (less old, stronger than BCODE, but still weak): not to be used any more. **SAP PWDSEALTEHASH** (newest, strongest) New **SAP** ...

Estimated Reading Time: 5 mins

See [kochind.com](#) results for [sap password cracking](#) >

SAP password hash hacking Part II: SAP PASSCODE ...

<https://www.saptechnicalguru.com> > [sap-password-hacking-passcode](#) ▼

This file we will combine with the file of the already found words from the BCODE part. The combination of two files is called combination attack. To start the **hacking** process go to the ...

Estimated Reading Time: 5 mins

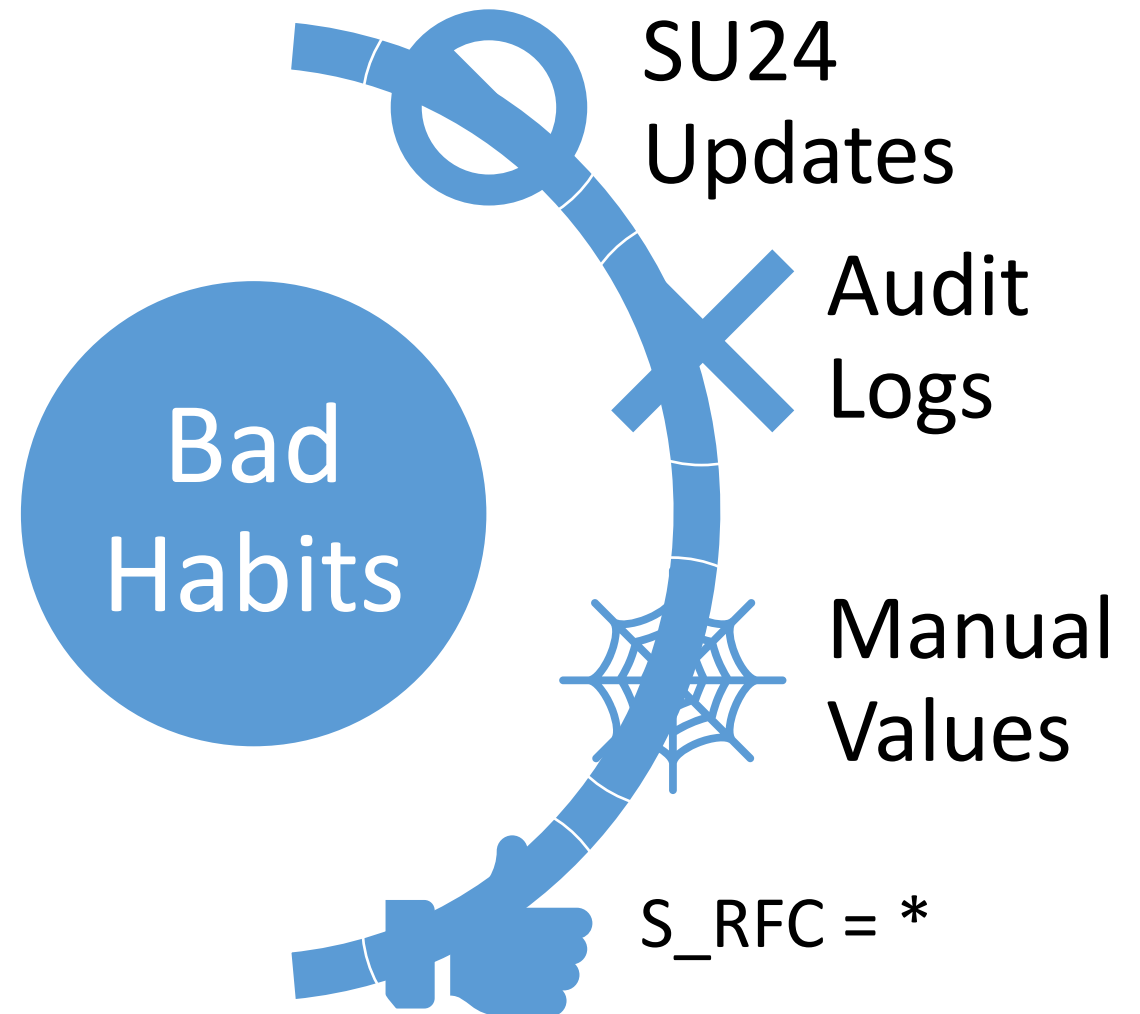
SAP Security Patch Day

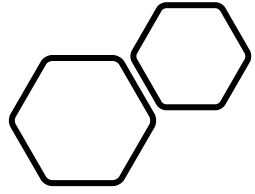
- Synchronized with software vendors like Microsoft on 2nd Tuesday
- Patching is required to protect against new types of attacks or newly identified weaknesses
- In a private data center behind a protected firewall – patching is important
- With cloud data centers, internet enabled applications, hosted applications – patching is critical
- [SAP Security Notes & News](#)

Reducing Client Risk

- ECC Single System User with tightly controlled access
- S/4HANA has many users but can be mitigated with proper role design
- Eliminate obsolete clients
 - SAP Note 1749142 – Removing unused clients including client 001 and 066 to reduce attack surface
- [Lock SAP* and remove role assignments](#)
- [Lock DDIC User Account except for upgrades](#)
- RSUSR003 Check Standard users for locking and password risk
- SAPCPIC is obsolete and should be deleted (Confirm EDI and RFC are not hardcoded)

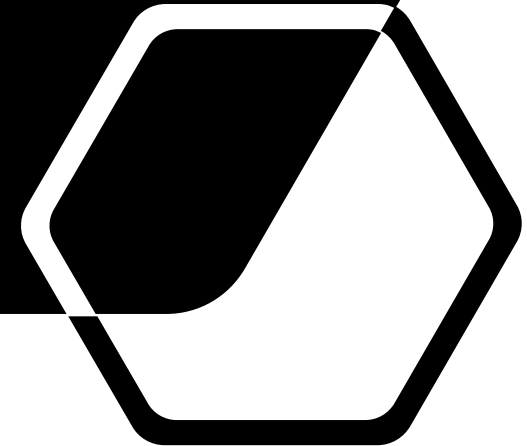
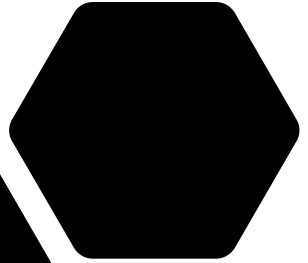
To Reduce Risk Requires a Change of Habits





PASSWORDS

Who uses a userID and
password of 8 characters
or less for SAP
authentication?



Impact of Stolen Passwords

- Internationally, the average cost of a data breach in 2020 for businesses was \$3.86 million, according to IBM. However, for the U.S, the average cost was the highest worldwide at \$8.64 million.
- In the manufacturing industry specifically, malware that stole credentials and dumped passwords created 922 cybersecurity incidents in 2020. 73 percent of these incidents were motivated by financial incentives, while with 27 percent of these incidents, the motive was espionage.
- If companies have a data breach caused by stolen credentials, they can lose up to three percent of their overall market value long-term. For the retail industry, this loss triples to nine percent within only 30 days of the breach announcement. According to researchers from the University of North Carolina's Kenan Flagler Business School, this increase is due to the fact that retail customers are less brand loyal than consumers in other industries.

Impact of Stolen Passwords - 2

Top Data Compromised	% of Manufacturers with Data Breaches in 2020
Credentials	55%
Personal	49%
Payment	20%
Other	25%

- Data breach data sourced from: [How Secure Is My Password? | Password Strength Checker \(security.org\)](#) which sites multiple additional data sources.

How secure is your password?

Are Your Passwords in the Green?
(hivesystems.io)

TIME IT TAKES A HACKER TO BRUTE FORCE YOUR PASSWORD IN 2022

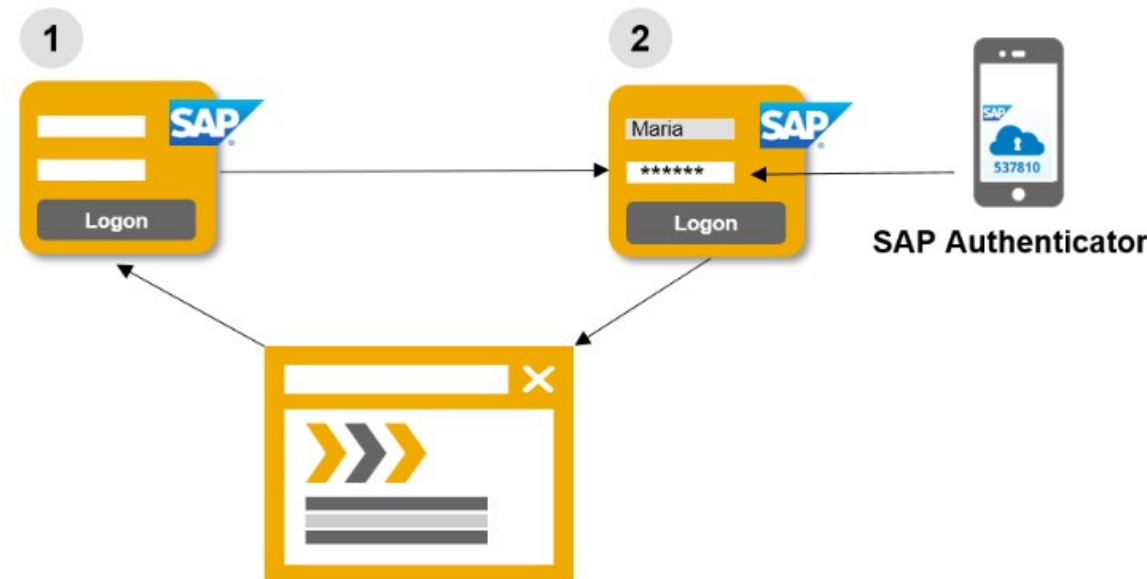
Number of Characters	Numbers Only	Lowercase Letters	Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters	Numbers, Upper and Lowercase Letters, Symbols
4	Instantly	Instantly	Instantly	Instantly	Instantly
5	Instantly	Instantly	Instantly	Instantly	Instantly
6	Instantly	Instantly	Instantly	Instantly	Instantly
7	Instantly	Instantly	2 secs	7 secs	31 secs
8	Instantly	Instantly	2 mins	7 mins	39 mins
9	Instantly	10 secs	1 hour	7 hours	2 days
10	Instantly	4 mins	3 days	3 weeks	5 months
11	Instantly	2 hours	5 months	3 years	34 years
12	2 secs	2 days	24 years	200 years	3k years
13	19 secs	2 months	1k years	12k years	202k years
14	3 mins	4 years	64k years	750k years	16m years
15	32 mins	100 years	3m years	46m years	1bn years
16	5 hours	3k years	173m years	3bn years	92bn years
17	2 days	69k years	9bn years	179bn years	7tn years
18	3 weeks	2m years	467bn years	11tn years	438tn years



> Learn about our methodology at hivesystems.io/password

Solutions to Reduce Password Risks

- Implement Multi-Factor Authentication
- Deactivate SAP passwords
- Use biometric data, secureID tokens, USB Yubikeys
- X.509 certificates from company managed devices
- Solutions such as SAP Single Sign on are easy implementations



Planning your Digital Transformation

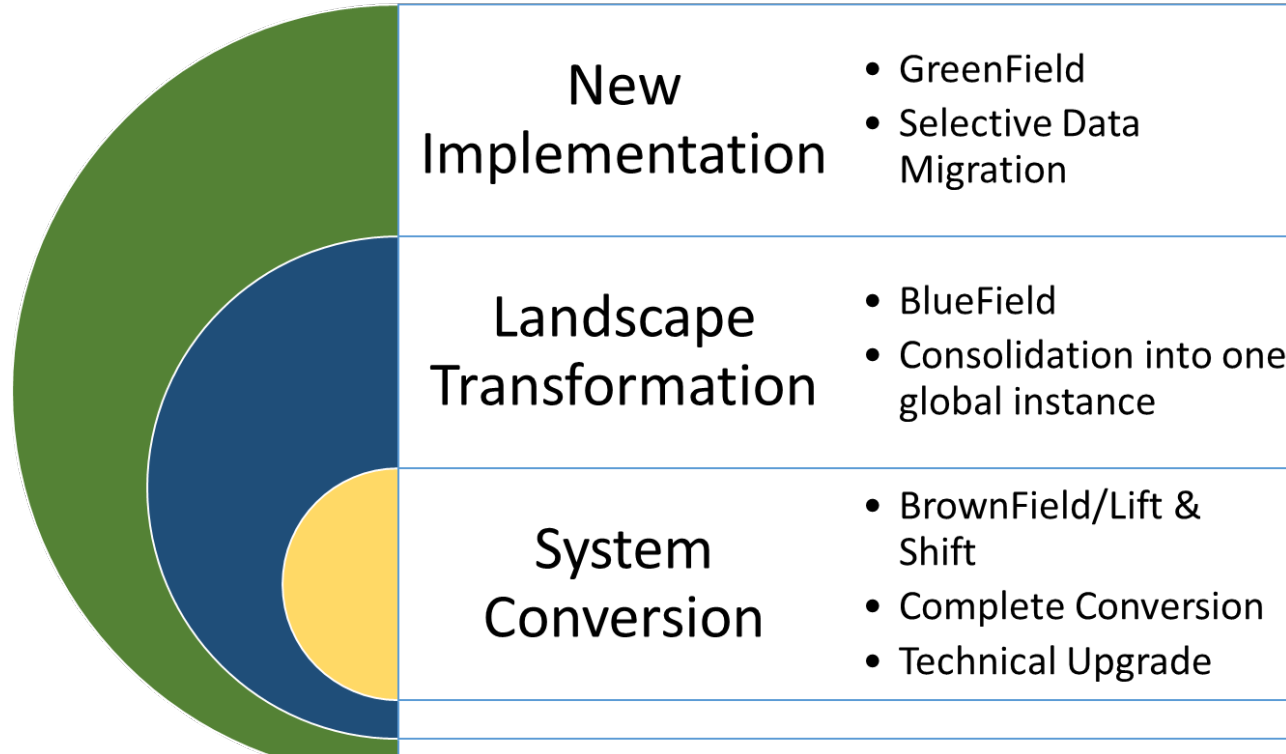




Migration Planning – Security

A destination was picked but the path for your journey takes planning before you pack the bus.

Migration Planning



- What is your roadmap?
- Which path is the right path?
- Are there tools to help management with educated paths?

[SAP Transformation Navigator](#)



S4HANA Security Scope

- Every Path to S4HANA impacts Security with new business processes
- Any migration path to S4HANA requires activity analysis

Using DATA to Drive Requirements



DATA



KNOWLEDGE



REQUIREMENTS



S4HANA Security Scope

Transactional Activity – ST03N

SAP Workload in System S4P

ST03N Previous View Refresh Data Directory and Load Data from Database Full Screen On/Off Save View More

Expert mode

- gplvaps4q9_S4P_20
- Total
 - Day
 - Week
 - Month
 - 02/2020
 - 01/2020
 - 12/2019
 - 11/2019
- Analysis Views
 - Workload Overview
 - Transaction Profile
 - Standard
 - EarlyWatch
 - Time Profile
- Ranking Lists
- Memory Use Statistics
- RFC Profiles
- User and Settlement Statistics

Instance: TOTAL
Period: 02/2020
Task type: NONE

First record: 02/01/2020 00:00:00
Last record: 02/28/2020 23:59:59
Time period: 28 Day(s): 00:00:00

Times Database Parts of response time GUI times All data

Transaction profile: Times: T Total time (s), Ø Time/step (ms)

Task type Aggregation

Report or Transaction name	Name of Background Job	# Steps	T Response Time	Ø Time	Process.	Avg. Proc. T
CL_AICCMSBI_ASR_READ=====...		1,711	51,875	30,318.7	7,811	4,56
MB5T		1,691	372	220.2	93	5
MR11SHOW		1,689	2,029	1,201.1	800	47
PA30		1,685	616	365.7	163	9
/1LT/SAPLSLP100000000004713		1,682	61	36.3	48	2
RBDAGAIN	S4_DEV_RBDAGAIN_REPROCESS_HT...	1,680	85,683	51,001.6	81,063	48,25
CA03		1,672	413	247.2	198	11
SAPLCORU		1,671	21	12.4	20	1
CNMASSSTATUS		1,668	1,367	819.6	56	3

Transactional Activity – GRC Action Usage

Table: GRACACTUSAGE
Fields: 7 of 9 Fixed Columns: [2] List Width 0250

ACTION_USAGE_ID	CONNECTOR	USER_ID	ACTION	EXECUTION_DATE
028125681EC61EDA92CDD165D34C1D27	S4	J	VA03	20,200,207,135,845
028125681EC61EDA92CDD1B20FFE5D27	S4	E	VK13	20,200,207,135,838
028125681EC61EDA92CDD224FE8F5D29	S4	E	VK13	20,200,207,135,829
028125681EC61EDA92CDD24AF37B1D2A	S4	E	VK13	20,200,207,135,823
028125681EC61EDA92CDD29715A1DD2A	S4	E	VA02	20,200,207,135,817
028125681EC61EDA92CDD2BF25077D2A	S4	E	VA02	20,200,207,135,812
028125681EC61EDA92CDD2E37EDD3D2A	S4	E	VA02	20,200,207,135,809
028125681EC61EDA92CDD2E37EDF9D2A	S4	R	VA02	20,200,207,135,806
028125681EC61EDA92CDD2E37EE05D2A	S4	J	VA03	20,200,207,135,806
028125681EC61EDA92CDD3096D75FD2A	S4	E	VA02	20,200,207,135,801
028125681EC61EDA92CDD3300FBFFD2A	S4	E	VK13	20,200,207,135,757
028125681EC61EDA92CDD35631529D2A	S4	E	VK13	20,200,207,135,754
028125681EC61EDA92CDD37BFCFCBD2A	S4	E	VA02	20,200,207,135,749
028125681EC61EDA92CDD3C86B05BD2A	S4	D	VB12	20,200,207,135,738
028125681EC61EDA92CDD3EEBF7C1D2A	S4	E	VA02	20,200,207,135,737
028125681EC61EDA92CDD43ADE71D2A	S4	E	VA02	20,200,207,135,730
028125681EC61EDA92CE2A71956FFE76	S4	A	VA03	20,200,207,144,320
028125681EC61EDA92CE2B074E769E76	S4	A	VA03	20,200,207,144,256
028125681EC61EDA92CE2B2D67ACDE78	S4	J	VT70	20,200,207,144,251
028125681EC61EDA92CE2B2D67AD1E78	S4	A	VA03	20,200,207,144,250
028125681EC61EDA92CE2BA044957E78	S4	M	VK11	20,200,207,144,235
028125681EC61EDA92CE2BA044973E78	S4	M	VK11	20,200,207,144,234
028125681EC61EDA92CE2BC68E239E79	S4	M	VK11	20,200,207,144,229
028125681EC61EDA92CE2BECDC65E79	S4	J	VT70	20,200,207,144,228
028125681EC61EDA92CE2BECDC689E79	S4	M	VK11	20,200,207,144,225
028125681EC61EDA92CE2BECDC6A3E79	S4	M	VA03	20,200,207,144,222
028125681EC61EDA92CE2C12B48D9E79	S4	H	VA03	20,200,207,144,219
028125681EC61EDA92CE2C3839C35E79	S4	M	VA03	20,200,207,144,213

Historical Analysis

- If 12 months of data, how many transactions with less than 100 executions are mistakes?
- If there are old and new transactions, why are both in the design?
- Will your business processes be the same after S4 implementation?
- Do you have SCM or APO? Several functions are reintegrated to the S4 Core.

ME20	SC Stock Monitoring (Vendor)	18426
ME2W	Purchase Orders for Supplying Plant	36
ME31K	Create Contract	108
ME32K	Change Contract	4190
ME33	Display Outline Agreement	400
ME33K	Display Contract	3194
ME3K	Outl. Agreements by Acct. Assignment	10
ME3L	Outline Agreements per Vendor	590
ME3M	Outline Agreements by Material	1891
ME47	Create Quotation	9
ME4M	RFQs by Material	1
ME51	Create Purchase Requisition	87
ME51N	Create Purchase Requisition	30294
ME52	Change Purchase Requisition	2577
ME52N	Change Purchase Requisition	43946
ME53	Display Purchase Requisition	415
ME53N	Display Purchase Requisition	22544
ME54N	Release Purchase Requisition	4346
ME55	Collective Release of Purchase Reqs.	739
ME57	Assign and Process Requisitions	30232
ME58	Ordering: Assigned Requisitions	367

Lessons Learned from Analysis

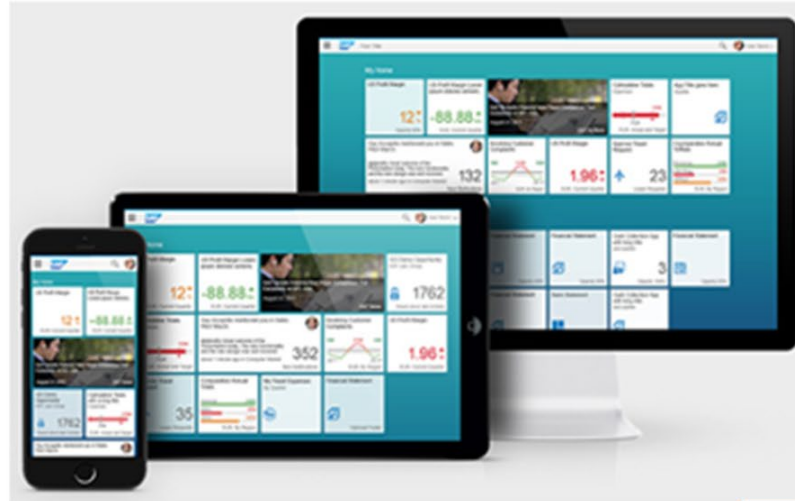
Errors occurred for the following transactions:	
Transaction	Error
(BLANK)	The transaction does not exist
/LOT/SO_REL_DOC	The transaction does not exist
/LOT/SO_REL_DOCP	The transaction does not exist
/LOT/SO_REL_OPT	The transaction does not exist
/LOT/SO_REL_OPTP	The transaction does not exist
/LOT/VO_TVLP	The transaction does not exist
/LOT/VO_VK	The transaction does not exist
/LOT/VO_OCX_CUS	The transaction does not exist
J4I3	The transaction does not exist
J4I6	The transaction does not exist
MF02	The transaction does not exist
MF03	The transaction does not exist
N	The transaction does not exist
SE11_OLD	The transaction does not exist
SE12_OLD	The transaction does not exist
SP1T	The transaction does not exist
WEDI	The transaction does not exist

Examples for replaced transactions in SAP S/4HANA	<p>For the maintenance of the credit account master data, transaction FD32 is replaced by transaction UKM_BP.</p> <p>For releasing credit-blocked sales orders, transaction VKM1 is replaced by transaction UKM_MY_DCDS. To use transaction UKM_MY_DCDS, the credit specialist might need additional authorizations. As a workaround, the transactions VKM1 and VKM4 are still available.</p>
Transactions not available in SAP S/4HANA	<p>F.28 - Customers: Reset Credit Limit</p> <p>F.31 - Credit Management - Overview</p> <p>F.32 - Credit Management - Missing Data</p> <p>F.33 - Credit Management - Brief Overview</p> <p>F.34 - Credit Management - Mass Change</p> <p>FCV1 - Create A/R Summary</p> <p>FCV2 - Delete A/R Summary</p> <p>FCV3 - Early Warning List</p> <p>FD24 - Credit Limit Changes</p> <p>FD32 - Change Customer Credit Management (but FD33 still available for Migration checks)</p> <p>FDK43 - Credit Management - Master Data List</p> <p>S_ALR_87012215 - Display Changes to Credit Management</p> <p>S_ALR_87012218 - Credit Master Sheet</p> <p>VKM2 - Released SD Documents</p> <p>VKM3 - Sales Documents</p> <p>VKM5 - Deliveries</p>
Reports not available in SAP S/4HANA	<p>RFARI020 - FI-ARI: Extract from credit master data</p> <p>RFARI030 - FI-ARI: Import credit master data</p> <p>RFDFILZE - Credit Management: Branch/Head Office Reconciliation Program</p>

- As SAP Simplification occurs, more transactions will become obsolete
- Your business processes from your existing system may already be obsolete
- Simplification eliminates many tables, but some still exist to enable migration to customizing

SAP provides tools for transformation, simplification and documentation
Using these simplifies migration

Analysis helps with scope, but planning is required for simplification and user experience improvements.



Security
Requirements



SU25

GRC
Ruleset

Security
Notes

SU24

Patch your
environment?

Follow best
practices?

Even with analysis and planning you will still discover obsolete transactions

- Best Practice:
 - Apply latest support packs
 - Execute SU25
 - Test every transaction in scope
 - Maintain SU24 Authorizations
 - Report Issues to SAP Support

Old Transaction	Old Transaction	Automatic Adjustment
Transaction	WLF1KO	Entry will be replaced
Transaction		Entry will be replaced
Transaction		Entry will be replaced
Transaction	ZPAR_UPD	Old entry will be deleted
Transaction	/SCTM/ROUTE	Old entry will be deleted
Transaction	IP30	Old entry will be deleted
Transaction	GRAC_EAM	Old entry will be deleted
Transaction	MB1C	Entry will be replaced
Transaction	GRAC_EAM	Old entry will be deleted
Transaction	WLF1KO	Entry will be replaced
Transaction	GRAC_EAM	Old entry will be deleted
Transaction		Old entry will be deleted
Transaction	MB1C	Entry will be replaced
Transaction	VKM3	Old entry will be deleted
Transaction	VKM1	Old entry will be deleted
Transaction	/SCWM/WM_BATCH_MAINT	Old entry will be deleted
Transaction	MD01N	Old entry will be deleted
Transaction	MB03	Old entry will be deleted
Transaction	KKRC	Old entry will be deleted

<input type="checkbox"/> Print Payment Form	Not Installed	SAP_TC_FIN_FO_BE_APPS: S4FIN SAP Finance - Accounts Payable/Receivable: Classic Apps	SAP_SFIN_BC_AP_PAY_PRI NT Accounts Payable - Print Payment Form	
Desktop FBZ5				
<input type="checkbox"/> Quick Create Free Form Payment	Not Installed	SAP_TC_FIN_FO_COMMON SAP: Financials - Accounts Payable Receivable Apps	SAP_SFIN_BC_AP_PAY_PR OC Accounts Payable - Payments	
Desktop, Phone, Tablet <u>F3038</u>				
<input type="checkbox"/> Reverse Check/BOE - For Supplier	Not Installed	SAP_TC_FIN_FO_BE_APPS: S4FIN SAP Finance - Accounts Payable/Receivable: Classic Apps	SAP_SFIN_BC_AP_REVERS AL Accounts Payable - Reversal	
Desktop F-46				
<input type="checkbox"/> Schedule Accounts Payable Jobs	Not Installed	SAP_TC_FIN_FO_COMMON SAP: Financials - Accounts Payable Receivable Apps	SAP_SFIN_BC_AP_PERIOD _ACT Accounts Payable - Periodic Activities	SAP_SFIN_BCG_AP_PERIO DIC_ACT Periodic Activities for Accounts Payable
Desktop, Tablet <u>F2257</u>				

Transactions vs. Fiori Apps

Fiori Terminology

Fiori Launchpad

- User access point
- Tiles related to apps

Catalog

- Set of apps for one role



Group

- Subset of apps from one or more catalogs

Roles

- Provide access to assigned groups & catalogs

FIORI Apps Library



Apps (9)

product allocation

Filtered by: Product Suite (SAP S/4HANA) , UI Technology (16) , Line of Business (1)

Other SAP Fiori Apps

☐

Assign Product to Product Allocation

☐

Configure Product Allocation

☐

Manage Characteristic Catalogs

☒

Manage Product Allocation Planning Data

☐

Manage Product Allocation Sequences

☐

Monitor Product Allocation Characteristic Value Combinations

☐

Monitor Product Allocation Order Items

App Details

* Added automatically due to dependencies

OData Service(s)

The following OData services must be activated on the front-end server
Users require PFCG authorization for the front-end and back-end systems.

OData Service	Version	Software Component Version	Back-End Authorization Role (PFCG)
ATP_MANPRODALLOCPLNG DATA	0001	S4CORE 104	
ATP_ASSGPRODTOPRODAL LOC *			
ATP_CONFIGUREPRODALLOC *			
ATP_MANPRODALLOCSEQUENCE *			

* Added automatically due to dependencies

[https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/#/detail/Apps\('F2121'\)/S16OP](https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/#/detail/Apps('F2121')/S16OP)

Backend S4 Role

Group/Object/Authorization/Field	Maintenan...	A...	Value	Text
Object class AAAB	Standard			Cross-application Authorization Objects
Authorization Object S_SERVICE	Standard			Check at Start of External Services
Authorizat. T-SD72676700	Standard			Check at Start of External Services
SRV_NAME	Standard	68	FACA41D42B4F2C8BD93405CC...	Program, transaction or function module name
SRV_TYPE	Standard	68	Hash Value for TADIR Object	Type of Check Flag and Authorization Default Values



Define Values

Type: TADIR Service

Maintain Service Name



Name	Prog. I...	Object Type	Object Name
FACA41D42B4F2C8BD93405CC924829	R3TR	IWSV	ATP_MANPRODALLOCPLNGDATA 0001

SAP Gateway Role

Group/Object/Authorization/Field	Maintena...	λ..	Value	Text
▼ OO Object class AAAB	Standard			Cross-application Authorization Objects
▼ OO Authorization Object S_SERVICE	Standard			Check at Start of External Services
▼ OO Authorizat. T-GD09119800	Standard			Check at Start of External Services
▪ SRV_NAME	Standard	⊕⊖	CA4A4E24A495AB720B2A8A885...	Program, transaction or function module name
▪ SRV_TYPE	Standard	⊕⊖	Hash Value for TADIR Object	Type of Check Flag and Authorization Default Values

Define Values

Type TADIR Service

Maintain Service Name

Name	Prog. ID	Object Type	Object Name
CA4A4E24A495AB720B2A8A8852170D	R3TR	IWSG	ZATP_MANPRODALLOCPLNGDATA_0001

Fiori Applications may require services in both front end and back-end roles. These services link to the ODATA services which are being called.

GRC Access Control Ruleset Required Updates for Fiori and HANA



2720157 - Access risk analysis shows no results after upgrade



2600114 - Missing S4HANA Fiori Functions in BC Set
GRAC_RA_RULESET_COMMON in SP20 of V1100 (SP06 of V8000)



2704494 - S4HANA & Fiori Risk Analysis does not show correct violations



2697987 - S4H and FIORI SOD risk analysis shows Fiori Apps from S4H connector



* * *

Lesson Learned – Although GRC Access Control may not require upgrade, notes and configuration were required.

S4 Security Development is 3X ECC Development

ECC

- PFCG Role

S4

- PFCG Role
- GW Role
- Catalogs
- Groups
- SU24 Updates
- Services
- Research
- Multiple Systems
- ...

Do not underestimate security development or testing



SOD Violations

What is the status of your existing controls?



Managing Change is an Ongoing
Process!

Replacement of SAP Fiori launchpad Home Page by Spaces and Pages

SAP Note 2970113 Solution

- Please be aware that the classic SAP Fiori launchpad home page that collects all groups of the assigned business roles for a user will be replaced by the spaces and pages. The group-based home page is deprecated and will be replaced in a future version.
- “Deprecated” implies that a feature is no longer enhanced and will be replaced in the future. In order to remove functionality, SAP announces this at least two releases in advance.
- The first step planned is to have spaces and pages as default instead of the classic SAP Fiori launchpad homepage. This is planned earliest in the year 2023.
- The replacement step is planned to follow at a later point in time.

[Jocelyn Dart SAP Blog - Migrating from groups to spaces and pages – Why, When, and Key Differences](#)



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