Database for service operations

Purpose of SVCdb database is to store data necessary for service center operations and support its operations based on data available. Database in this status represents minimum level which is necessary to handle customers, employess connected to repair process, devices received for repair and service orders as core of operations.

Simplification
SVCdb is designed to support multi-country, multi-manufacture, multi-device operations but sample data used cover only hungarian customers, two manufacturers and mobile phones and tablets.

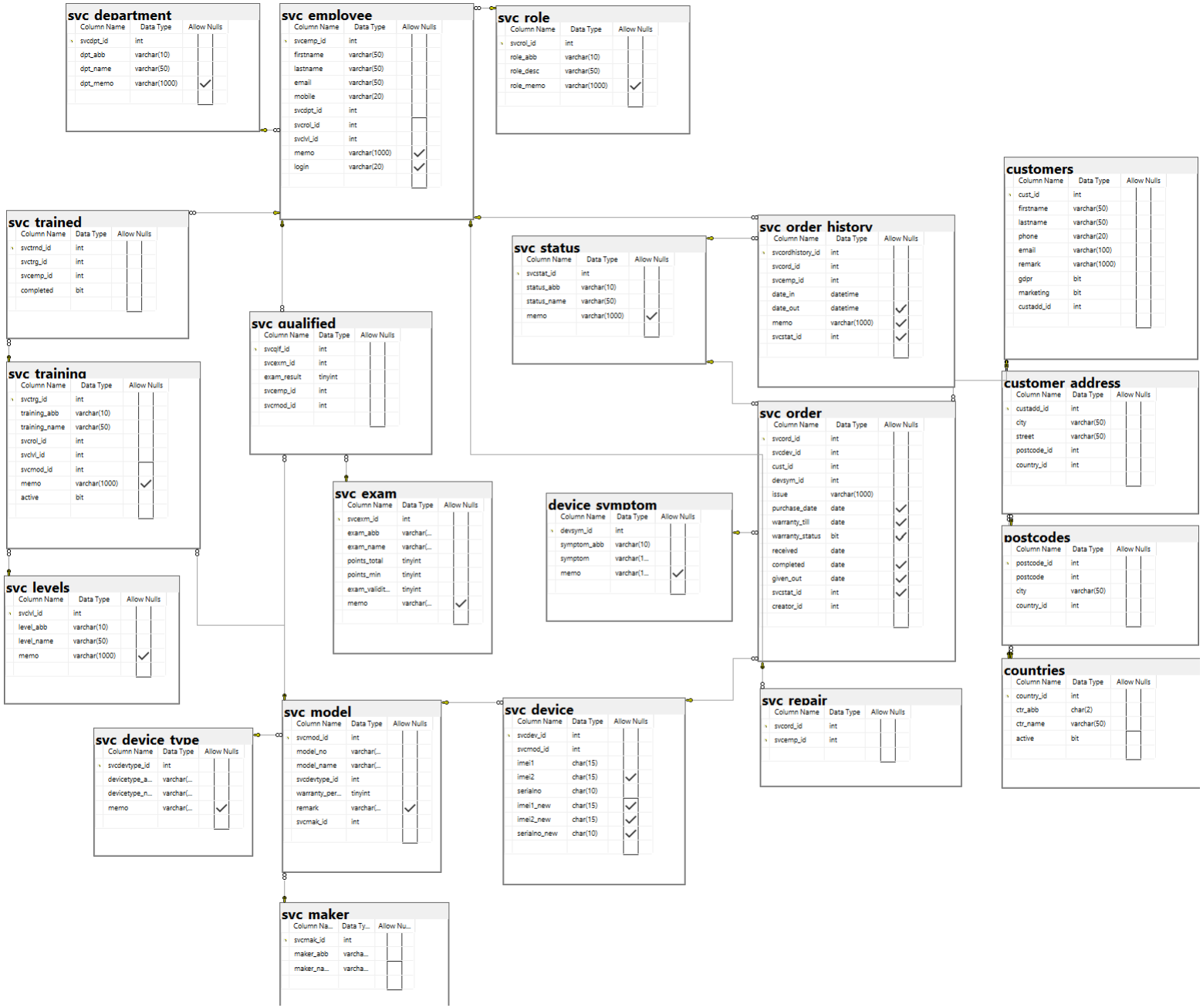
Data sources for sample data
1. customers - all data used in database are randomly generated data. No real data was used as source.
2. employees - all data used in database are randomly generated data. No real data was used as source.
3. addresses - all data used in database are randomly generated data. No real data was used as source.
4. phone numbers - all data used in database are randomly generated data to match numbering standard. No real data was used as source.
5. models - publicly available data used
6.IMEI numbers and serial numbers - randomly generated data to match numbering standard.

General description of service process
1. customer brings device to service center for repair:
Customer's personal data need to be registered together with the device given for repair. Device is accepted for repair if matching the directory manufacturer/model data, warranty repair and out of warranty repair is shown matching the base criteria.

2. repair process
When device handled by initial administration, it is assigned to service employee who is authorized to handle repair after completed training and exam for model. Standard repair process follows this flow: incoming administration - test for symptom - repair of device - test for functionality - outgoing administration.

3. customer picks up device from service center after repair

Database diagram



Schema: dbo

Base schema dbo is used. No additional schema is used because of the size of the database itself.

Tables

dbo.countries

Name	Data type	Nullable	Default	Description	Check
country_id	int	NOT NULL		PK Country ID	PK
ctr_abb	char(2)	NOT NULL		ISO short name	UNIQUE [A-Z][A-Z]
ctr_name	varchar(50)	NOT NULL		Full name	
active	bit	NOT NULL		Currently used Active/Inactive	

dbo.postcodes

Name	Data type	Nullable	Default	Description	Check
postcode_id	int	NOT NULL		PK Postal code ID	PK
postcode	int	NOT NULL		Postal code	[1-9] [0-9] [0-9] [0-9]
city	varchar(50)	NOT NULL		City	
country_id	int	NOT NULL		Country ID	FK

dbo.customer_address

Name	Data type	Nullable	Default	Description	Check
custadd_id	int	NOT NULL		PK address ID	PK
city	varchar(50)	NOT NULL		City	
street	varchar(50)	NOT NULL		Street	
postcode_id	int	NOT NULL		Postcode	FK
country_id	int	NOT NULL		Country ID	FK

dbo.customers

Name	Data type	Nullable	Default	Description	Check
cust_id	int	NOT NULL		Primary key for Customers	PK
firstname	varchar(50)	NOT NULL		Customer's first name	
lastname	varchar(50)	NOT NULL		Customer's last name	
phone	varchar(20)	NOT NULL		Customer's phone number	+[1-9]...[1-0]
email	varchar(100)	NOT NULL		Customer's email address	%__@__%
remark	varchar(1000)	NOT NULL		Remarks for customer data	
gdpr	bit	NOT NULL		Customer's consent with data processing	
marketing	bit	NOT NULL		Customer's consent with marketing communication	
custadd_id	int	NOT NULL		Connecting field for Customer's address information	FK

dbo.device_symptom

Name	Data type	Nullable	Default	Description	Check
devsym_id	int	NOT NULL		PK for Device Symptom table	PK
symptom_abb	varchar(10)	NOT NULL		Short name	UNIQUE
symptom	varchar(100)	NOT NULL		Symptom description	
memo	varchar(1000)	NULL		Additional information	

dbo.svc_department

Name	Data type	Nullable	Default	Description	Check
svcdpt_id	int	NOT NULL		PK Service department	PK
dpt_abb	varchar(10)	NOT NULL		Short name	UNIQUE
dpt_name	varchar(50)	NOT NULL		Full name	
dpt_memo	varchar(1000)	NULL		Memo	

dbo.svc_device

Name	Data type	Nullable	Default	Description	Check
svcdev_id	int	NOT NULL		PK Device ID	PK
svcmod_id	int	NOT NULL		Service model ID	FK
imei1	char(15)	NOT NULL		IMEI1	imei1 like '[0-9]...[0-9]'
imei2	char(15)	NULL		IMEI2	imei2 like '[0-9]...[0-9]' or imei2 is NULL
serialno	char(10)	NOT NULL		Seriál number	serialno not like '%[^0-9a-z]%'
imei1_new	char(15)	NULL		IMEI1 new	imei1 like '[0-9]...[0-9]'
imei2_new	char(15)	NULL		IME2 new	imei2_new like '[0-9]...[0-9]' or imei2 is NULL
serialno_new	char(10)	NULL		Serial number new	serialno_new not like '%[^0-9a-z]%'

Remark:

1) IMEI1 and IMEI2 identify the same device in case device works with 2 SIM cards.

2) IMEI1_new, IMEI2_new and serialno_new fields are part of design, when full device is exchanged during the repair. This scenario has not been covered, all three fields are NULLs then.

dbo.svc_device_type

Name	Data type	Nullable	Default	Description	Check
svcdevtype_id	int	NOT NULL		PK Device type ID	PK
devicetype_abb	varchar(10)	NOT NULL		Device type short name	UNIQUE
devicetype_name	varchar(50)	NOT NULL		Device type full description	
memo	varchar(1000)	NULL		Memo	

dbo.svc_employee

Name	Data type	Nullable	Default	Description	Check
svcemp_id	int	NOT NULL		PK service employee ID	PK
firstname	varchar(50)	NOT NULL		First name	
lastname	varchar(50)	NOT NULL		Last name	
email	varchar(50)	NOT NULL		Email	%__@__%
mobile	varchar(20)	NOT NULL		Mobile phone	+[1-9]...[1-0]
svcdpt_id	int	NOT NULL		Service department ID	FK
svcrol_id	int	NOT NULL		Service role ID	FK
svclvl_id	int	NOT NULL		Service level ID	FK
memo	varchar(1000)	NULL		Memo	
login	varchar(20)	NULL		Login	

dbo.svc_exam

Name	Data type	Nullable	Default	Description	Check
svcexm_id	int	NOT NULL		PK service exam ID	PK
exam_abb	varchar(10)	NOT NULL		Exam short name	UNIQUE
exam_name	varchar(50)	NOT NULL		Exam full name	
points_total	tinyint	NOT NULL		Points total	
points_min	tinyint	NOT NULL		Points min	
exam_validity_months	tinyint	NOT NULL		Validity in months	
memo	varchar(1000)	NULL		Memo	

dbo.svc_levels

Name	Data type	Nullable	Default	Description	Check
svclvl_id	int	NOT NULL		PK service level ID	PK
level_abb	varchar(10)	NOT NULL		Service level short name	UNIQUE
level_name	varchar(50)	NOT NULL		Service level full name	
memo	varchar(1000)	NULL		Memo	

dbo.svc_maker

Name	Data type	Nullable	Default	Description	Check
svcmak_id	int	NOT NULL		PK Maker ID	PK
maker_abb	varchar(10)	NOT NULL		Maker short name	UNIQUE
maker_name	varchar(50)	NOT NULL		Maker full name	

dbo.svc_model

Name	Data type	Nullable	Default	Description	Check
svcmod_id	int	NOT NULL		PK service model ID	PK
model_no	varchar(20)	NOT NULL		Model number	UNIQUE
model_name	varchar(50)	NOT NULL		Model name	
svcdevtype_id	int	NOT NULL		Device type ID	FK
warranty_period	tinyint	NOT NULL		Warranty period	'[0-4][0-8]'
remark	varchar(1000)	NULL		Remark	
svcmak_id	int	NOT NULL		Maker ID	FK

dbo.svc_order

Name	Data type	Nullable	Default	Description	Check
svcord_id	int	NOT NULL		PK service order ID	PK
svcdev_id	int	NOT NULL		Device ID	FK
cust_id	int	NOT NULL		Customer ID	FK
devsym_id	int	NOT NULL		Device symptom ID	FK
issue	varchar(1000)	NOT NULL		Issue	
purchase_date	date	NULL		Purchase date	
warranty_till	date	NULL		Warranty till	
warranty_status	bit	NULL		Warranty status	
received	date	NOT NULL		Received from customer	
completed	date	NULL		Repair completed	
given_out	date	NULL		Returned to customer	
svcstat_id	int	NULL		Service status ID	FK
creator_id	int	NOT NULL		Creator ID	

Remark: creator_id is inserted based on the value given by external application.

dbo.svc_order_history

Name	Data type	Nullable	Default	Description	Check
svcordhistory_id	int	NOT NULL		PK service order history	PK
svcord_id	int	NOT NULL		Service order ID	FK
svcemp_id	int	NOT NULL		Service employee ID	FK
date_in	datetime	NOT NULL		Date/time received by employee	
date_out	datetime	NULL		Date/time given out by employee	
memo	varchar(1000)	NULL		Memo	
svcstat_id	int	NULL		Service status ID	FK

dbo.svc_qualified

Name	Data type	Nullable	Default	Description	Check
svcqlf_id	int	NOT NULL		PK Qualified ID	PK
svcexm_id	int	NOT NULL		Exam ID	FK
exam_result	tinyint	NOT NULL		Exam result	
svcemp_id	int	NOT NULL		Employee ID	FK
svcmod_id	int	NOT NULL		Service model ID	FK

dbo.svc_repair

Name	Data type	Nullable	Default	Description	Check
svcord_id	int	NOT NULL		service order ID	PK
svcemp_id	int	NOT NULL		service employee ID	FK

dbo.svc_role

Name	Data type	Nullable	Default	Description	Check
svcrol_id	int	NOT NULL		PK service role ID	PK
role_abb	varchar(10)	NOT NULL		Service role short name	UNIQUE
role_desc	varchar(50)	NOT NULL		Service role full name	
role_memo	varchar(1000)	NULL		Memo	

dbo.svc_status

Name	Data type	Nullable	Default	Description	Check
svcstat_id	int	NOT NULL		PK service status	PK
status_abb	varchar(10)	NOT NULL		Service status short name	UNIQUE
status_name	varchar(50)	NOT NULL		Service status full name	
memo	varchar(1000)	NULL		Memo	

dbo.svc_trained

Name	Data type	Nullable	Default	Description	Check
svctrnd_id	int	NOT NULL		PK trained ID	PK
svctrg_id	int	NOT NULL		Training ID	FK
svcemp_id	int	NOT NULL		Employee ID	FK
completed	bit	NOT NULL		Completed	

dbo.svc_training

Name	Data type	Nullable	Default	Description	Check
svctrg_id	int	NOT NULL		PK service training	PK
training_abb	varchar(10)	NOT NULL		Training short name	UNIQUE
training_name	varchar(50)	NOT NULL		Training full name	
svcrol_id	int	NOT NULL		Service role ID	FK
svclvl_id	int	NOT NULL		Service level ID	FK
svcmod_id	int	NOT NULL		Service model ID	FK
memo	varchar(1000)	NULL		Memo	
active	bit	NOT NULL		Is Active (NULL/NOT NULL)	

Check constraints

Constraint	Type	Code
CK_countries	CONSTRAINT	Contains only 2characters A-Z [CK_countries] CHECK (([ctr_abb] like '[A-Z][A-Z]'))
CK_customers_email	CONSTRAINT	Checks for correct email formate [CK_customers_email] CHECK (([email] like '%__@__%'))
CK_customers_phone	CONSTRAINT	Check for correct international phone number format [CK_customers_phone] CHECK (([phone] like '+[1-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]'))
CK_postcodes	CONSTRAINT	Postal Code contains numbers only [CK_postcodes] CHECK (([postcode] like '[1-9][0-9][0-9][0-9]'))
CK_svc_device_ime2_new	CONSTRAINT	IMEI2 contains numbers only or NULL value [CK_svc_device_ime2_new] CHECK (([imei2_new] like '[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]' OR [imei2_new] IS NULL))
CK_svc_device_IMEI1	CONSTRAINT	IMEI1 contains numbers only [CK_svc_device_IMEI1] CHECK (([imei1] like '[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]'))
CK_svc_device_imei1_new	CONSTRAINT	IMEI1_new contains numbers only [CK_svc_device_imei1_new] CHECK (([imei1_new] like '[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]'))
CK_svc_device_IMEI2	CONSTRAINT	IMEI2_new contains numbers only or NULL value [CK_svc_device_IMEI2] CHECK (([imei2] like '[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]' OR [imei2] IS NULL))
CK_svc_device_serialno_new	CONSTRAINT	Serial number contains only letters or numbers [CK_svc_device_serialno_new] CHECK ((NOT [serialno_new] like '%[^0-9a-z]%'))
CK_svc_device_SN	CONSTRAINT	Serial number contains only letters or numbers [CK_svc_device_SN] CHECK ((NOT [serialno] like '%[^0-9a-z]%'))
CK_svc_employee_email	CONSTRAINT	Checks for correct email formate CK_svc_employee_email] CHECK (([email] like '%___@___%'))
CK_svc_employee_phone	CONSTRAINT	Check for correct international phone number format [CK_svc_employee_phone] CHECK (([mobile] like '+[1-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]'))
CK_svc_model	CONSTRAINT	Checks warranty period 0-48 (months) [CK_svc_model] CHECK (([warranty_period] like '[0-4][0-8]'))

Indexes

Index neve	Oszlop (ok)	Index típusa	Értelmezés
PK_countries	country_id	clustered	Primary key
PK_customers	cust_id	clustered	Primary key
PK_customer_address	custadd_id	clustered	Primary key
IX_svc_device_type	devicetype_abb	non clustered	Index based on device type short name
PK_device_symptom	devsym_id	clustered	Primary key
IX_svc_department	dpt_abb	non clustered	Index based on department short name
IX_svc_employee	email	non clustered	Index based on employee's email address
IX_svc_levels	level_abb	non clustered	Index based on levels short name
IX_svc_maker	maker_abb	non clustered	Index based on maker short name
IX_svc_employee_1	mobile	non clustered	Index based on employee's phone number
PK_postcodes	postcode_id	clustered	Primary key
IX_svc_role	role_abb	non clustered	Index based on service role short name
IX_svc_status	status_abb	non clustered	Index based on service status short name
PK_svc_device	svcdev_id	clustered	Primary key
PK_svc_device_type	svcdevtype_id	clustered	Primary key
PK_svc_department	svcdpt_id	clustered	Primary key
PK_svc_employee	svcemp_id	clustered	Primary key
PK_svc_exam	svcexm_id	clustered	Primary key
PK_svc_levels	svclvl_id	clustered	Primary key
PK_svc_maker	svcmak_id	clustered	Primary key
PK_svc_model	svcmod_id	clustered	Primary key
PK_svc_order	svcord_id	clustered	Primary key
PK_svc_repair	svcord_id, svcemp_id	clustered	Primary key
PK_svc_order_history	svcordhistory_id	clustered	Primary key
PK_svc_qualified	svcqlf_id	clustered	Primary key
PK_svc_role	svcrol_id	clustered	Primary key
PK_svc_status	svcstat_id	clustered	Primary key
PK_svc_training	svctrg_id	clustered	Primary key
PK_svc_trained	svctrnd_id	clustered	Primary key
IX_svc_training	training_abb	non clustered	Index based on training short name

Triggers

Trigger	Trigger type	Description
triggerInsertSvcOrderHistory	DML INSERT	After new service order data inserted into table svc_order, new row added to service order history table svc_order_history with current employee ID for tracking purposes.
triggerUpdateSvcRepair	DML INSERT, UPDATE, DELETE	After record updated in table svc_order_history, employee information inserted/updated into or deleted from table svc_repair.

Table connections

Relation name	Type	DELETE/UPDATE
FK_customer_address_countries	1:N	NO CASCADE
FK_postcodes_countries	1:N	NO CASCADE
FK_customer_address_postcodes	1:N	NO CASCADE
FK_customers_customer_address	1:N	NO CASCADE
FK_svc_order_customers	1:N	NO CASCADE
FK_svc_order_device_symptom	1:N	NO CASCADE
FK_svc_employee_svc_department	1:N	NO CASCADE
FK_svc_device_svc_model	1:N	NO CASCADE
FK_svc_order_svc_device	1:N	NO CASCADE
FK_svc_model_svc_device_type	1:N	NO CASCADE
FK_svc_employee_svc_role	1:N	NO CASCADE
FK_svc_order_history_svc_employee	1:N	NO CASCADE
FK_svc_qualified_svc_employee	1:N	NO CASCADE
FK_svc_repair_svc_employee	1:N	NO CASCADE
FK_svc_trained_svc_employee	1:N	NO CASCADE
FK_svc_qualified_svc_exam	1:N	NO CASCADE
FK_svc_training_svc_levels	1:N	NO CASCADE
FK_svc_model_svc_maker	1:N	NO CASCADE
FK_svc_qualified_svc_model	1:N	NO CASCADE
FK_svc_training_svc_model	1:N	NO CASCADE
FK_svc_order_svc_status	1:N	NO CASCADE
FK_svc_repair_svc_order	1:N	NO CASCADE
FK_svc_order_history_svc_status	1:N	NO CASCADE
FK_svc_trained_svc_training	1:N	NO CASCADE

VIEWS

Name	Title
dbo.viewCustomerFullData	Listing all details on Customers: Name, Contacts, Address Used in function `dbo.fnCustomerDataReview`
dbo.viewPhoneRepairStatus	Listing all details on Devices currently in service center Used in function `dbo.fncheckOpenRepair`
dbo.vQualified	Listing all details on Qualified personnel
dbo.vTrained	Listing all details on Trained personnel
dbo.vTrainings	Listing all details on Trainings to be done

FUNCTIONS

Name	Type	Title
dbo.fnCustomerDataReview	SCALAR	Functions outputs full data of Customer based on phone number.
dbo.fncheckOpenRepair	SCALAR	Function outputs status on existing open service order.
dbo.fnCountry	SCALAR	Function outputs Country ID based on the name of Country
dbo.fnEmployee	SCALAR	Function outputs full name of employee based on his/her name.
dbo.fnFullAddress	SCALAR	Function outputs full address of customer
dbo.fnPostCode	SCALAR	Function outputs Postal code ID based on the Postal code value
dbo.fnWarrantyStatus	SCALAR	Function outputs infrormation if device repair is covered by warranty.
dbo.fnWarrantyValidTill	SCALAR	Function outputs information till when is device covered by warranty.

dbo.fnCustomerDataReview

Parameter name	Data type	Type	Default
Returns	table type	OUT	
phone	varchar(20)	IN	

This function is used to return customer information based on his/her phone number when called via external application.

dbo.fncheckOpenRepair

Parameter name	Data type	Type	Default
Returns	bit	OUT	
svcdev_id	int	IN	

This function is used in stored procedure procInsertSvcOrder.

dbo.fnCountry

Parameter name	Data type	Type	Default
Returns	int	OUT	
Country	varchar(50)	IN	

This function is used in stored procedure procInsertCustomer.

dbo.fnEmployee

Parameter name	Data type	Type	Default
Returns	varchar(100)	OUT	
id	int	IN	

dbo.fnFullAddress

Parameter name	Data type	Type	Default
Returns	varchar(255)	OUT	
id	int	IN	

dbo.fnPostCode

Parameter name	Data type	Type	Default
Returns	int	OUT	
PostCode	int	IN	

This function is used in stored procedure procInsertCustomer.

dbo.fnWarrantyStatus

Parameter name	Data type	Type	Default
Returns	bit	OUT	
svcdev_id	int	IN	
purchase_date	date	IN	

This function is used in stored procedure procInsertSvcOrder.

dbo.fnWarrantyValidTill

Parameter name	Data type	Type	Default
Returns	date	OUT	
svcdev_id	int	IN	
purchase_date	date	IN	

This function is used in stored procedure procInsertSvcOrder.

Stored procedures

Name	Title
dbo.procInsertCustomer	Insert New Customer, contact information and address to SVCdb
dbo.procInsertSvcOrder	Insert new service order to SVCdb
dbo.procRepairStatusByIMEI	Repair status check for the device currently under service handling

dbo.procInsertCustomer

Name	Data type	Type	Default
firstname	varchar(50)	INPUT	
lastname	varchar(50)	INPUT	
phone	varchar(20)	INPUT	
email	varchar(100)	INPUT	
remark	varchar(1000)	INPUT	
gdpr	bit	INPUT	
marketing	bit	INPUT	
city	varchar(50)	INPUT	
street	varchar(50)	INPUT	
postcode	int	INPUT	
country	varchar(50)	INPUT	

dbo.procInsertSvcOrder

Name	Data type	Mode	Default
svcdev_id	int	INPUT	
cust_id	int	INPUT	
devsym_id	int	INPUT	
issue	varchar(100)	INPUT	
purchase_date	date	INPUT	
svcstat_id	int	INPUT	
svcemp_id	int	INPUT	

dbo.procRepairStatusByIMEI

Name	Data type	Mode	Default
IMEI	varchar(15)	INPUT	
ORDER	int	INPUT	

Authorization system

Login	User	Role	Description
employee	employee	employee	Read/Write access to all tables within SVCdb
manager	manager	manager	Read/Write access to all tables within SVCdb
svc_admin	svc_admin	svc_admin	Read/Write access to all tables within SVCdb Authorized to set/modify security settings and access rights.
app	app	app	Full access on tables customers, svc_order, svc_order_history within SVCdb

Installation

Database installation is done via schema.sql script.
Test data installation is done via data.sql script.
Both scripts need to be run via suitable environment as described bellow.

Prerequisites:

- MS SQL server Enterprise or Developer edition, min 2019 version,
- SQL server management studio, min version 18.x.x or Azure Data Studio 1.36.x,
- 10MB free space

Backup/restore strategy

Backup plan
To maintain integrity a security of database, full recovery mode is in place. Regular backup routine is set with one full backup done daily and transaction logs backup on 4hours schedule.

Full backups are taken every day Monday to Sunday at 00:30 to file called SVCdb.bak located on location C:\backup\

Transaction log backups are taken every day in 4hour intervals (Monday-Sunday at 08:00, 12:00, 16:00, 20:00) to a file called SVCdb-logs.bak located on location C:\backup\

Restore plan
In case a user error (accidental `DELETE`) the plan is to restore data from the last available transaction log backup. In case of catastrophic failure, data restoration is made from the full backup.