UDTs To Add:

Structure of section:

• **Grandparent**

    ○ **Parent**

       - **Child**

Etc.

UDTs:

Note: Probably will need to make some UDTs specifically for DbSecurity.UserAuthorization and Process.WorkFlowSteps table, but those are not listed here since those tables are not included here as part of the scope of this PDF

• **Key**

    ○ **SurrogateKeyInt** (based on INT) (Reason: reusable for any surrogate key)

• **Description**

    ○ **LocationDescription**

       - **CountryName** (based on nvarchar(60)) (Reason: longest country name in world ~60 characters)

       - **RegionName** (based on nvarchar(20)) (Reason: longest continent name is ~20 characters, otherwise region is abbreviated and so is <20 characters)

       - **TownName** (based on nvarchar(50)) (Reason: reasonable length for a town name)

       - **Address** (based on nvarchar(60)) (Reason: standard length for addresses)

       - **PostCode** (based on nvarchar(9)) (Reason: post codes can go up to 9)

    ○ **ISODescription**

       - **ISO2** (based on nchar(2)) (Reason: these are only 2 characters long)

       - **ISO3** (based on nchar(3)) (Reason: these are only 3 characters long)

    ○ **CustomerName** (based on nvarchar(50)) (Reason: longest customer name is ~40 characters, 50 characters gives more leeway for longer)

    ○ **Flag** (based on bit) (Reason: can flag some column value to true/false where relevant)

○ **CurrencyName** (based on nvarchar(50)) (Reason: to ensure any specific currency name can fit)

○ **ColorName** (based on nvarchar(50)) (Reason: to allow flexibility on color name inputs)

○ **CarDescription** (based on nvarchar(20)) (Reason: longest make, model, and model variant name entry is ~15 characters)

○ **LineNumber** (based on smallint) (Reason: realistically will not have >30k items on one sale line)

• **DateOrTime**

○ **DateYYYYMMDD** (based on date) (Reason: keeps track of only dates)

○ **DateYYYY** (based on int) (Reason: only keeps track of year parts of a date)

○ **SaleTime** (based on time(0)) (Reason: realistically no reason to keep track of further precision after seconds)

○ **SaleDateTime** (based on DATETIME2(0)) (Reason: no real reason to keep track of further precision after seconds)
○ **StockCode** (based on nchar(36)) (Reason: all stock codes are 36 characters long)

• **Money** (based on NUMERIC(17, 2)) (Reason: allows for tracking money into the trillions (i.e. more than realistically necessary))

• **BuyerComment** (based on nvarchar(500)) (Reason: realistically a comment won't be absurdly long)

• **Invoice** (based on nchar (8)) (Reason: all invoices generated are 3 (CurrencyISO3) + 2 (Customer CountryISO2) + 3 (SaleID formatted to 3 digits) = 8 characters long)

Note For Following Changes:

Note: For the table changes, only those directly resulting from the change are listed for compactness (e.g., every table references DbSecurity.UserAuthorization, but for compactness it is not shown in the ERD listing the changes)
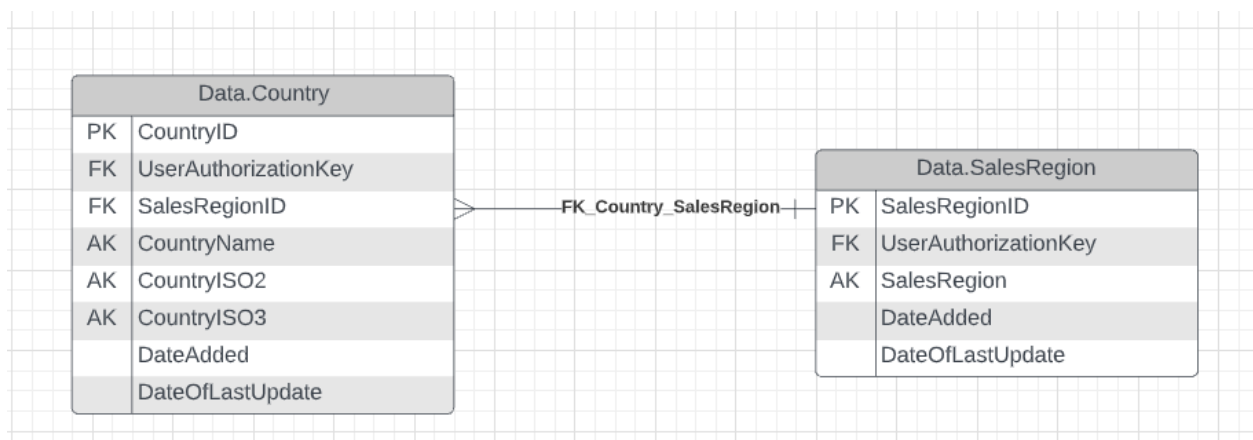
Data.Country Changes:

Original:

Column Name	Data Type	Allow Nulls
CountryName	nvarchar(150)	☑
CountryISO2	nchar(10)	☑
CountryISO3	nchar(10)	☑
SalesRegion	nvarchar(20)	☑
CountryFlag	varbinary(MAX)	☑
FlagFileName	nvarchar(50)	☑
FlagFileType	nchar(3)	☑
		☐

Country (Data)

After Changes:
ERD:

Data.Country

PK	CountryID
FK	UserAuthorizationKey
FK	SalesRegionID
AK	CountryName
AK	CountryISO2
AK	CountryISO3
	DateAdded
	DateOfLastUpdate

FK_Country_SalesRegion

Data.SalesRegion

PK	SalesRegionID
FK	UserAuthorizationKey
AK	SalesRegion
	DateAdded
	DateOfLastUpdate

Column Changes:
Added Columns:
• <u>UserAuthorizationKey, DateAdded, DateOfLastUpdate</u> (Reason: track member's work)

• <u>CountryID</u> (Reason: to act as a PK for Data.Country)

• <u>SalesRegionID</u> (Reason: to act as a PK for Data.SalesRegion)

Removed Columns:
• CountryFlag, FlagFileName, FlagFileType (Reason: only had NULL entries)

Column Data Types and Nullability:
Data.Country:
• CountryID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• SalesRegionID: SurrogateKeyInt, NOT NULL

• CountryName: CountryName, NOT NULL

• CountryISO2: ISO2, NOT NULL

• CountryISO3: ISO3, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.SalesRegion:
• SaleRegionID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• SalesRegion: RegionName, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.

• Anything marked AK has a unique constraint

Check Constraint:

• CountryISO3: [A-Z][A-Z][A-Z]

• CountryISO2: [A-Z][A-Z]
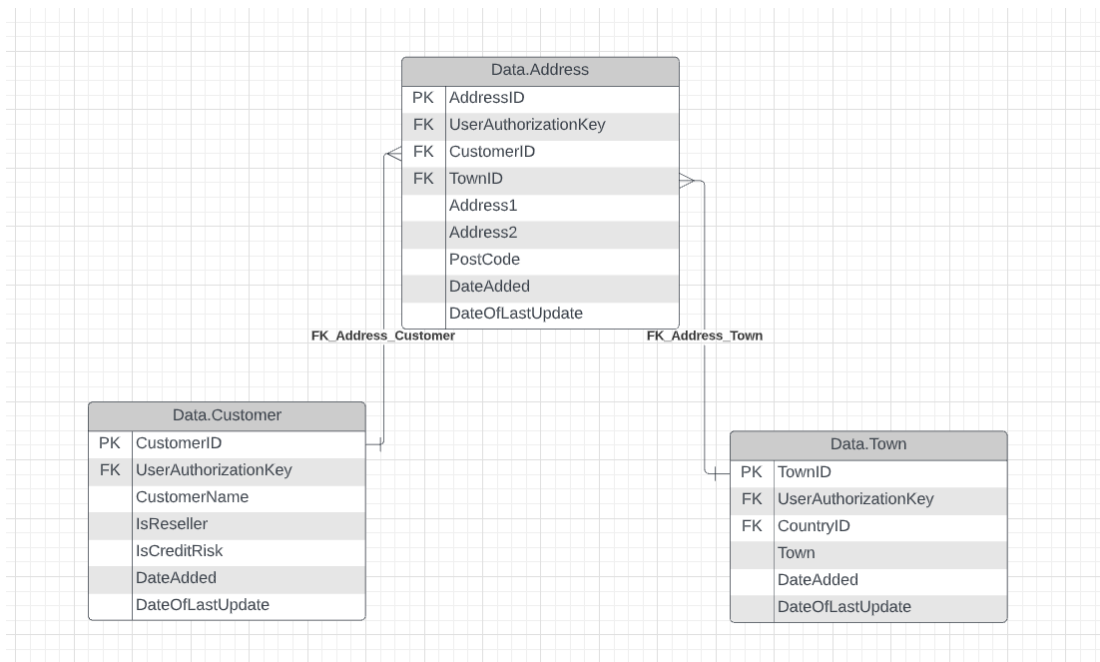
Default

• DateAdded, DateOfLastUpdate: SYSDATETIME()

Data.Customer Changes

Original:

Customer (Data)

Column Name	Data Type	Allow Nulls
CustomerID	nvarchar(5)	☐
CustomerName	nvarchar(150)	☑
Address1	nvarchar(50)	☑
Address2	nvarchar(50)	☑
Town	nvarchar(50)	☑
PostCode	nvarchar(50)	☑
Country	nchar(10)	☑
IsReseller	bit	☑
IsCreditRisk	bit	☑
		☐

After Changes:
ERD:

Data.Address

PK	AddressID
FK	UserAuthorizationKey
FK	CustomerID
FK	TownID
	Address1
	Address2
	PostCode
	DateAdded
	DateOfLastUpdate

FK_Address_Customer   FK_Address_Town

Data.Customer

PK	CustomerID
FK	UserAuthorizationKey
	CustomerName
	IsReseller
	IsCreditRisk
	DateAdded
	DateOfLastUpdate

Data.Town

PK	TownID
FK	UserAuthorizationKey
FK	CountryID
	Town
	DateAdded
	DateOfLastUpdate

Column Changes:

Added Columns:
• UserAuthorizationKey, DateAdded, DateOfLastUpdate (Reason: track member's work)

• AddressID (Reason: to act as the PK for Data.Address)

• TownID (Reason: to act as the PK for Data.Town)

• CountryID (Reason: to reference Data.Country as a FK in Data.Town)

Removed Columns:
• Country (Reason: replaced with CountryID as a means of acting as a FK)

Modified Columns:
• CustomerID: Changed from XXXX string to an int (Reason: less space used)

Column Data Types and Nullability:

Data.Customer:
• CustomerID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• IsReseller: Flag, NOT NULL

• IsCreditRisk, Flag, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.Address:

• AddressID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• CustomerID: SurrogateKeyInt, NOT NULL

• TownID: SurrogateKeyInt, NOT NULL

• Address1: Address, NOT NULL

• Address2: Address, NULL

• PostCode: PostCode, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.Town:

• TownID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• CountryID: SurrogateKeyInt, NOT NULL

• Town: TownName, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.
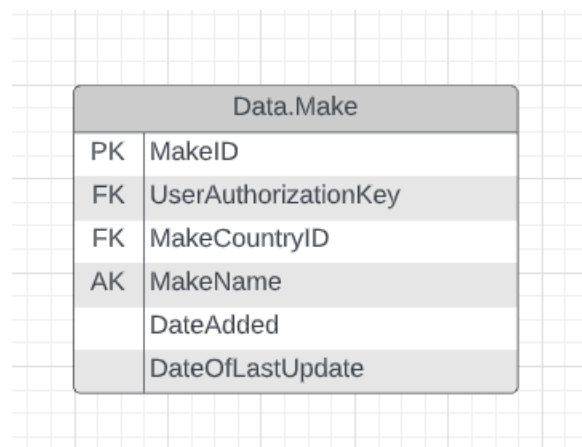
Default:

• DateAdded, DateOfLastUpdate: SYSDATETIME()

Data.Make Changes

Original:

Make (Data)		
Column Name	**Data Type**	**Allow Nulls**
MakeID	smallint	☐
MakeName	nvarchar(100)	☑
MakeCountry	char(3)	☑
		☐

After Changes:
ERD:

Data.Make	
PK	MakeID
FK	UserAuthorizationKey
FK	MakeCountryID
AK	MakeName
	DateAdded
	DateOfLastUpdate

Column Changes:

Added Columns:
• <u>UserAuthorizationKey, DateAdded, DateOfLastUpdate</u> (Reason: track member's work)

• <u>MakeCountryID</u> (Reason: to reference Data.Country as a FK)

Removed Columns:
• <u>MakeCountry</u> (Reason: replaced with MakeCountryID to use as FK)

Column Data Types and Nullability:

• MakeID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• MakeCountryID: SurrogateKeyInt, NOT NULL

• MakeName: CarDescription, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.

• Anything marked AK has a unique constraint

Default:

• DateAdded, DateOfLastUpdate: SYSDATETIME()
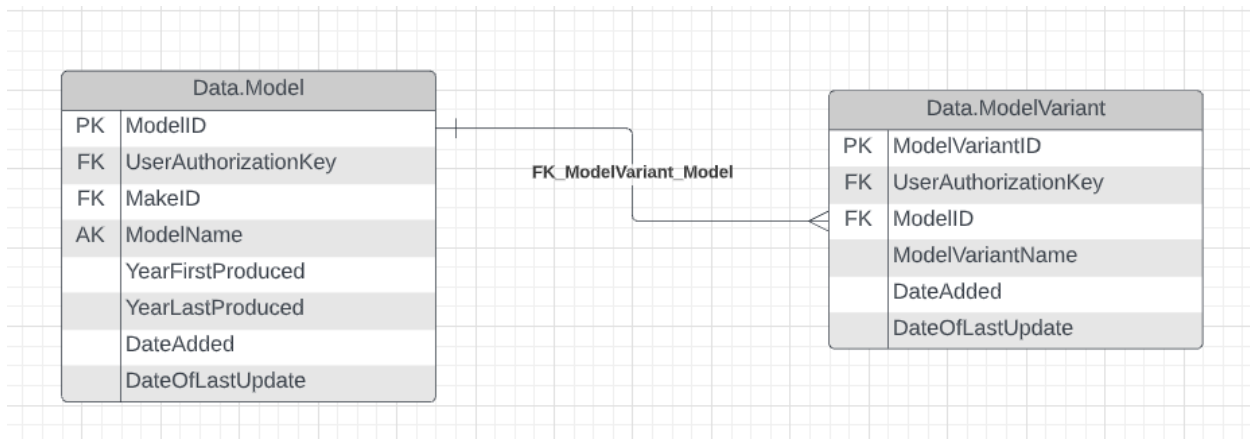
Data.Model Changes

Model (Data)

Column Name	Data Type	Allow Nulls
ModelID	smallint	☐
MakeID	smallint	☑
ModelName	nvarchar(150)	☑
ModelVariant	nvarchar(150)	☑
YearFirstProduced	char(4)	☑
YearLastProduced	char(4)	☑
		☐

After Changes:
ERD:

Column Changes:
Added Columns:
• <u>UserAuthorizationKey, DateAdded, DateOfLastUpdate</u> (Reason: track member's work)

• <u>ModelVariantID</u> (Reason: to use as a PK in Data.ModelVariant)

Modified Columns:
• <u>ModelVariant:</u> Renamed to <u>ModelVariantName</u> (Reason: name more fitting now that it is in Data.ModelVariant table)

Column Data Types and Nullability:

Data.Model:

• ModelID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• MakeID: SurrogateKeyInt, NOT NULL

• ModelName: CarDescription, NOT NULL

• YearFirstProduced: DateYYYY, NULL

• YearLastProduced: DateYYYY, NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.ModelVariant:

• ModelVariantID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• ModelID, SurrogateKeyInt, NOT NULL

• ModelVariantName: CarDescription, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.

• Anything marked AK has a unique constraint

Check Constraint:

• YearFirstProduced: IS NULL OR >1900 (realistically wouldn't sell cars older than that)

• YearLastProduced: IS NULL OR <= YEAR(SYSDATETIME) + 1 (or manually set year)

Default:

• DateAdded, DateOfLastUpdate: SYSDATETIME()

Other

• There is a variant that is just an empty string, do not put it into Data.ModelVariant
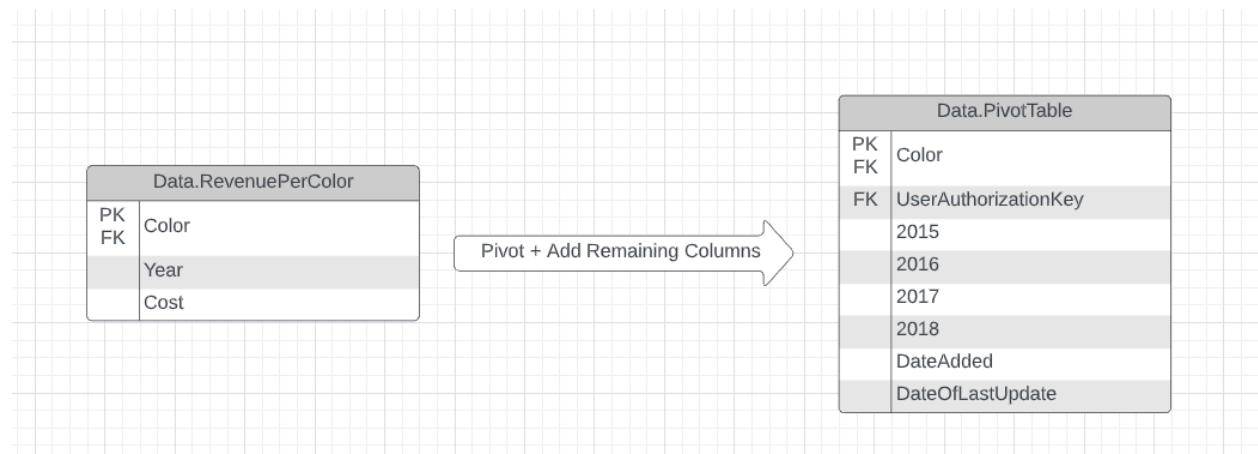
Data.PivotTable Changes

Original:

PivotTable (Data)		
Column Name	**Data Type**	**Allow Nulls**
Color	nvarchar(50)	☑
[2015]	numeric(38, 2)	☑
[2016]	numeric(38, 2)	☑
[2017]	numeric(38, 2)	☑
[2018]	numeric(38, 2)	☑
		☐

After Changes:

Plan:

Make a view / stored procedure which is pivoted + add user authorization details after

Reason: so the values are recomputed every time its called
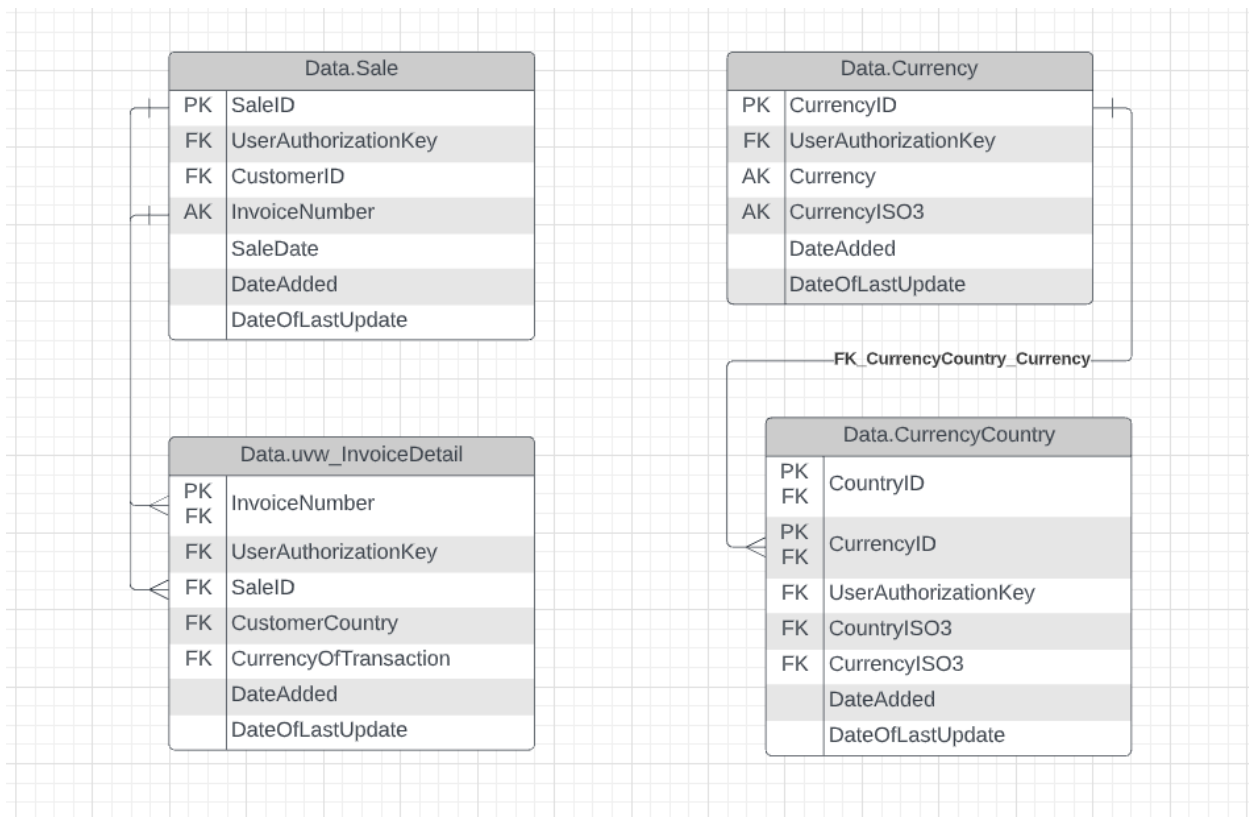

Data.RevenuePerColor

PK FK	Color
	Year
	Cost

Pivot + Add Remaining Columns

Data.PivotTable

PK FK	Color
FK	UserAuthorizationKey
	2015
	2016
	2017
	2018
	DateAdded
	DateOfLastUpdate

Data.Sales Changes

Original:

Sales (Data)

Column Name	Data Type	Allow Nulls
SalesID	int	☐
CustomerID	nvarchar(5)	☑
InvoiceNumber	char(8)	☑
TotalSalePrice	numeric(18, 2)	☑
SaleDate	datetime	☑
ID	int	☐
		☐

After Changes:

ERD:

Data.Sale

PK	SaleID
FK	UserAuthorizationKey
FK	CustomerID
AK	InvoiceNumber
	SaleDate
	DateAdded
	DateOfLastUpdate

Data.Currency

PK	CurrencyID
FK	UserAuthorizationKey
AK	Currency
AK	CurrencyISO3
	DateAdded
	DateOfLastUpdate

FK_CurrencyCountry_Currency

Data.uvw_InvoiceDetail

PK FK	InvoiceNumber
FK	UserAuthorizationKey
FK	SaleID
FK	CustomerCountry
FK	CurrencyOfTransaction
	DateAdded
	DateOfLastUpdate

Data.CurrencyCountry

PK FK	CountryID
PK FK	CurrencyID
FK	UserAuthorizationKey
FK	CountryISO3
FK	CurrencyISO3
	DateAdded
	DateOfLastUpdate

Column Changes:

Added Columns:

• <u>UserAuthorizationKey, DateAdded, DateOfLastUpdate</u> (Reason: track member's work)

• <u>CountryISO3</u>: (Reason: to reference Data.Country as a FK, but also get direct access to the ISO)

• <u>Currency</u>: (Reason: to have as a unique value in Data.Currency, give the name of currency)

• <u>CurrencyISO3</u>: (Reason: to have as a unique value in Data.Currency, lets it be used as alternate key so Data.CurrencyCountry can reference Data.Currency and use it as FK)

• <u>CurrencyOfTransaction</u>: (Reason: gives some information of the invoice)

• <u>CustomerCountry</u> (Reason: gives some information of the invoice)

• <u>CurrencyID</u>: (Reason: to act as a PK in Data.Currency)

Removed Columns:

• <u>ID</u> (Reason: redundant column, mirrors SaleID)

• <u>TotalSalePrice</u> (Reason: it is derived based off Data.SaleDetail, does not make much sense to derive something in a parent from a child, also means it is dependent on SaleDetail and not Sale so not really normalized if done like that)

Modified Columns:

• <u>SalesID</u>: Renamed to <u>SaleID</u> (Reason: makes naming more consistent)

Column Data Types and Nullability:

Data.Sale

• SaleID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• CustomerID: SurrogateKeyInt, NOT NULL

• InvoiceNumber: Invoice, NOT NULL

• SaleDate: SaleDateTime, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.Currency

• CurrencyID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• Currency: CurrencyName, NOT NULL

• CurrencyISO3: ISO3, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.CurrencyCountry

• CountryID: SurrogateKeyInt, NOT NULL

• CurrencyID: SurrogateKeyInt, NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• CountryISO3: ISO3, NOT NULL

• CurrencyISO3: ISO3, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.

• Anything marked AK has a unique constraint

Check Constraint:

• InvoiceNumber:

   ○ Option A: Set it up so it directly compares if the invoice matches a computed invoice using CurrencyISO3 + CountryISO2 + XXX SaleID (BETTER)

   ○ Option B: [A-Z][A-Z][A-Z][A-Z][A-Z][0-9][0-9][0-9]

Default:

• DateAdded, DateOfLastUpdate: SYSDATETIME()

Data.SalesDetails

Original:

Column Name	Data Type	Allow Nulls
SalesDetailsID	int	☐
SalesID	int	☑
LineItemNumber	tinyint	☑
StockID	nvarchar(50)	☑
SalePrice	numeric(18, 2)	☑
LineItemDiscount	numeric(18, 2)	☑
		☐

SalesDetails (Data)

After Changes:
ERD:

Data.SaleDetail	
PK	SaleDetailID
FK	UserAuthorizationKey
FK	SaleID
FK	StockID
	LineItemNumber
	SalePrice
	LineItemDiscount
	DateAdded
	DateOfLastUpdate

Column Changes:

Added Columns:
• UserAuthorizationKey, DateAdded, DateOfLastUpdate (Reason: track member's work)

Modified Columns:
• SalesDetailID: Renamed to SaleDetailID (Reason: make naming more conisistent)

Column Data Types and Nullability:

• SaleDetailID: SurrogateKeyInt, Identity(1,1), NOT NULL

• UserAuthorizationKey: SurrogateKeyInt, NOT NULL

• SaleID: SurrogateKeyInt, NOT NULL

• StockID: SurrogateKeyInt, NOT NULL

• LineItemNumber: LineNumber, NOT NULL

• SalePrice: Money, NOT NULL

• LineItemDiscount: Money, NOT NULL

• DateAdded: DateYYYYMMDD, NOT NULL

• DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.

Check Constraint:

• LineItemNumber: Have it ensure it is not less or greater than the current expected line value (e.g. Check if = COUNT(SaleID), though not sure how you could actually implement it)

• SalePrice: check if >= 0

• LineItemDiscount: check if >= 0

Default:

• DateAdded, DateOfLastUpdate: SYSDATETIME()

• LineItemDiscount: 0 (i.e. no discount)

• LineItemNumber: Have it try to automatically insert next value on line (e.g. COUNT(SaleID) + 1, but not sure how you could auto-generate it)
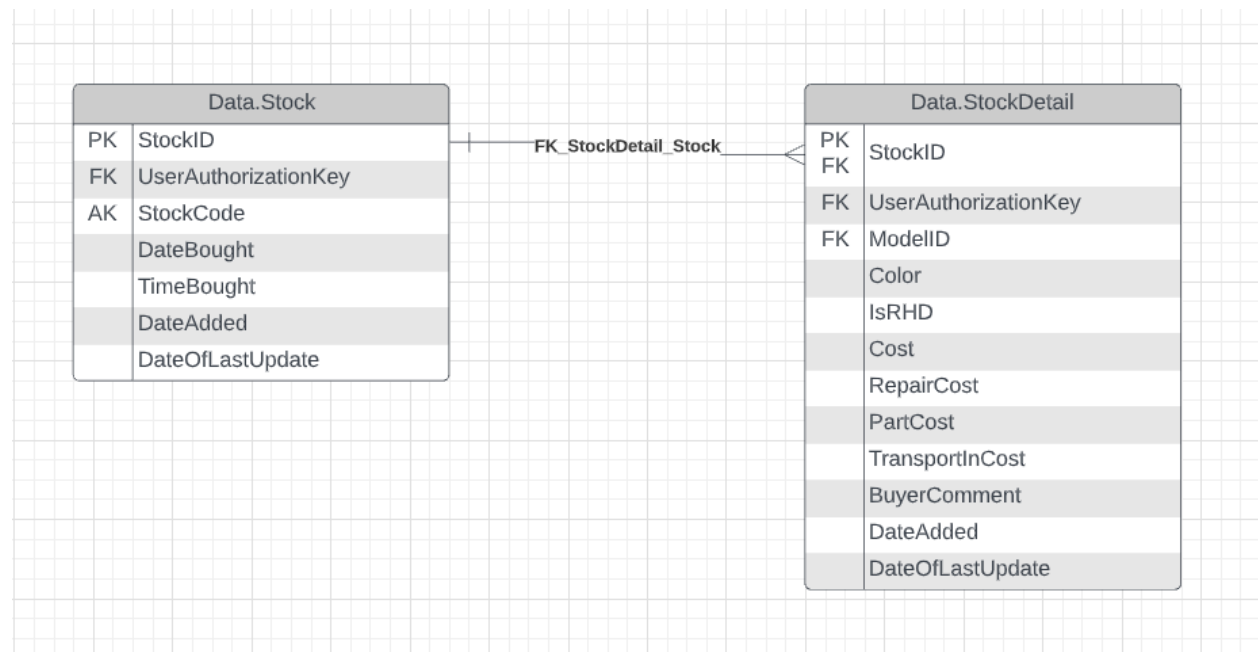
Data.Stock

Stock (Data)

Column Name	Data Type	Allow Nulls
StockCode	nvarchar(50)	☑
ModelID	smallint	☑
Cost	money	☑
RepairsCost	money	☑
PartsCost	money	☑
TransportInCost	money	☑
IsRHD	bit	☑
Color	nvarchar(50)	☑
BuyerComments	nvarchar(4000)	☑
DateBought	date	☑
TimeBought	time(7)	☑
		☐

After Changes:
ERD:

Data.Stock		
PK	StockID	
FK	UserAuthorizationKey	
AK	StockCode	
	DateBought	
	TimeBought	
	DateAdded	
	DateOfLastUpdate	

FK_StockDetail_Stock

Data.StockDetail		
PK FK	StockID	
FK	UserAuthorizationKey	
FK	ModelID	
	Color	
	IsRHD	
	Cost	
	RepairCost	
	PartCost	
	TransportInCost	
	BuyerComment	
	DateAdded	
	DateOfLastUpdate	

Column Changes:

Added Columns:
- <u>UserAuthorizationKey, DateAdded, DateOfLastUpdate</u> (Reason: track member's work)

Column Data Types and Nullability:

Data.Stock
- StockID: SurrogateKeyInt, Identity(1,1), NOT NULL
- UserAuthorizationKey: SurrogateKeyInt, NOT NULL
- StockCode: StockCode, NOT NULL
- DateBought: DateYYYYMMDD, NOT NULL
- TimeBought: SaleTime, NOT NULL
- DateAdded: DateYYYYMMDD, NOT NULL
- DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Data.StockDetail
- StockID: SurrogateKeyInt, NOT NULL
- UserAuthorizationKey: SurrogateKeyInt, NOT NULL
- ModelID: SurrogateKeyInt, NOT NULL
- Color: ColorName, NOT NULL
- IsRHD: Flag, NOT NULL
- Cost: Money, NOT NULL
- RepairCost: Money, NOT NULL
- PartCost: Money, NOT NULL
- TransportInCost: Money, NOT NULL
- BuyerComment: BuyerComment, NOT NULL
- DateAdded: DateYYYYMMDD, NOT NULL
- DateOfLastUpdate: DateYYYYMMDD, NOT NULL

Constraints

• Primary Keys are marked PK in the diagram – all PKs are clustered indexes, Foreign Keys are marked FK.

• Anything marked AK has a unique constraint

Check Constraint:
• All Cost-related rows: check if >= 0

Default:
• DateAdded, DateOfLastUpdate: SYSDATETIME()

• All Cost-related (excluding Cost alone) columns: 0.00 (i.e., can easily filter out these rows if there is an insertion issue, but initial Cost should always be known)

• BuyerComment: "No Comment"

Other

• There is 1 row where basically all columns besides two have null entries, this row will be removed from the database as it is more than likely just erroneous data