CodeMash 2022

Leslie Andrews, 3Cloud
Sandusky, OH
January 11-14, 2022
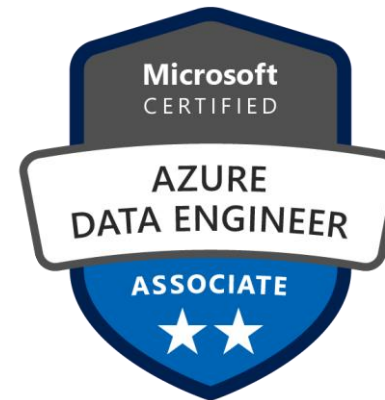
A Perfect Ten

The Data Model

About me

- **Leslie Andrews**
  - 20+ years IT experience
  - Idera ACE 2019
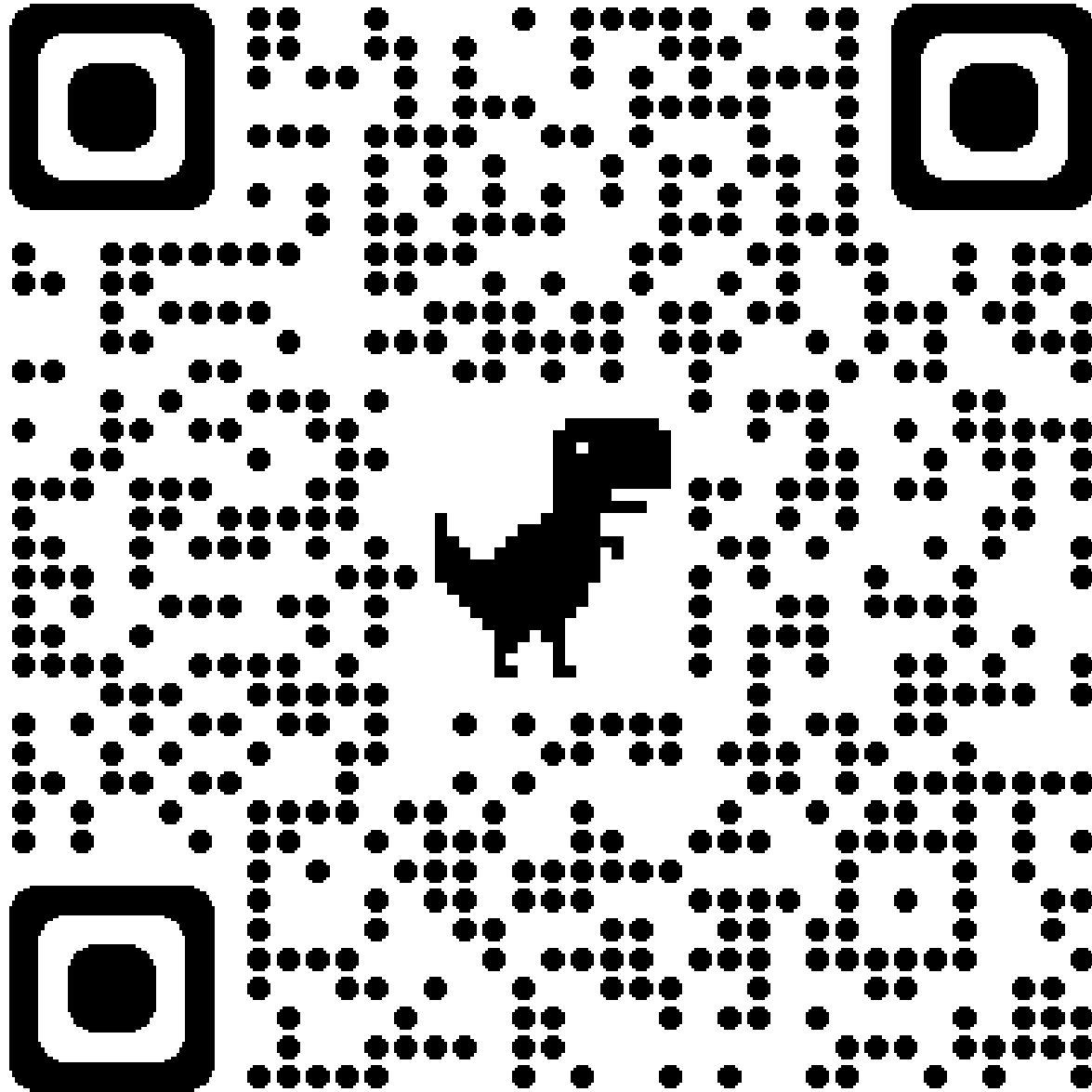 - Speaker
- **3Cloud**
Lead Data Architect
November 2019

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3Cloud Current Jobs

Looking for Work?

https://grnh.se/
db603bf72us

TODAY'S OBJECTIVES

Comparison of Third Normal Form and Dimensional Models

Leave with ability to look at databases critically

The Perfect Ten

Winner

2018 Westminster
Best In Show

Zsa-zsa

Winner

2018 World's
Ugliest Dog Contest

The Right Model for the Job

A Relational Model: Normalization

- Edgar Codd
  - The relational model for database management is an approach to managing data using a structure and language consistent with first-order predicate logic where all data is represented in terms of tuples, grouped into relations. A database organized in terms of the relational model is a relational database.

The Right Model for the Job

A Relational Model: Normalization

OLTP – Online Transactional Processing

Operational Systems that do the Business of the Organization

Many Create/Read/Update/Delete operations completed quickly

The Right Model for the Job

A Dimensional Model: Star Schema

- Ralph Kimball
  - Dimensional modeling includes a set of methods, techniques and concepts for use in data warehouse design. The approach focuses on identifying the key business processes within a business and modelling and implementing these first before adding additional business processes, a bottom-up approach.

The Right Model for the Job

A Dimensional Model: Star Schema

OLAP – Online Analytical Processing

Low volume of transactions

Reporting of aggregates

Support cube analysis

The Right Model for the Job

Other Models

📊	Graph (SQL 2017)	Nodes & Edges to define relationships
▪	Document	Lotus Notes
▪	Entity-Attribute-Value	Key Value
▪	Columnar	

Creating a Perfect 10

Normalization

Database normalization is the process of restructuring data in order to reduce data redundancy and improve data integrity.

Wikipedia: https://en.wikipedia.org/wiki/Third_normal_form/

Why Normalize?

Prevent undesirable insert, update, delete dependencies

Reduce the need for restructuring when adding new data

Easier to understand

1NF (First Normal Form)

2NF (Second Normal Form)

3NF (Third Normal Form)

BCNF (Boyce-Codd Normal Form)

4NF (Fourth Normal Form)

5NF (Fifth Normal Form)

6NF (Sixth Normal Form)

Levels of Normalization

Normal Forms – Example

S.H.I.E.L.D.

Normal Forms – 1NF

- Verify table has Primary Key
- Ensure that the values in each column of a table are atomic.

SuperheroName	AlterEgo
IronMan	Tony Stark
Black Widow	Natasha Romanoff
Thor	
Wasp	Hope van Dyne
Dr. Strange	Dr. Stephen Strange

Normal Forms – 1NF

- Verify table has Primary Key
- Ensure that the values in each column of a table are atomic.

SuperheroId	SuperheroName	AlterEgo
1000	IronMan	Tony Stark
1001	Black Widow	Natasha Romanoff
1002	Thor	
1003	Wasp	Hope van Dyne
1004	Dr. Strange	Dr. Stephen Strange
1005	Spiderman	Peter Parker
1006	Spiderman	Miles Morales

Normal Forms – 1NF

- Verify table has Primary Key
- Ensure that the values in each column of a table are atomic.

SuperheroId	SuperheroName	AlterEgo	Gadgets
1000	IronMan	Tony Stark	Ironman outfit, Arc Reactor
1001	Black Widow	Natasha Romanoff	
1002	Thor		Mjolnir, Stormbreaker
1003	Wasp	Hope van Dyne	Wasp Outfit
1004	Dr. Strange	Dr. Stephen Strange	Eye of Agamotto, Cloak of Levitation

Normal Forms – 1NF

- Verify table has Primary Key
- Ensure that the values in each column of a table are atomic.

SuperheroId	SuperheroName	AlterEgo	Gadge...	
1000	IronMan	Tony Stark	Arc...	Ironman...
1001	Black Widow	Natasha Romanoff		
1002	Thor		M...	...mbreake...
1003	Wasp	Hope van Dyne	W... ...utfit	
1004	Dr. Strange	Dr. Stephen Strange	Eye... ...motto	Cloa...

Normal Forms – 1NF

- Verify table has Primary Key
- Ensure that the values in each column of a table are atomic.

SuperheroId	SuperheroName	AlterEgo	Gadget
1000	IronMan	Tony Stark	Arc Reactor
1001	IronMan	Tony Stark	Ironman outfit
1002	Black Widow	Natasha Romanoff	
1003	Thor		Mjolnir
1004	Thor		Stormbreaker
1005	Wasp	Hope van Dyne	Wasp Outfit
1006	Dr. Strange	Dr. Stephen Strange	Eye of Agamotto
1007	Dr. Strange	Dr. Stephen Strange	Cloak of Levitation

Normal Forms – 2NF

- Table is in 1NF

- All the non-key attributes must be dependent on the whole key.

Normal Forms – 2NF

- Verify table is in 1NF
- All the non-key attributes must be dependent on the whole key.

SuperheroId	SuperheroName	AlterEgo	Gadget
1000	IronMan	Tony Stark	Arc Reactor
1001	IronMan	Tony Stark	Ironman outfit
1002	Black Widow	Natasha Romanoff	
1003	Thor		Mjolnir
1004	Thor		Stormbreaker
1005	Wasp	Hope van Dyne	Wasp Outfit
1006	Dr. Strange	Dr. Stephen Strange	Eye of Agamotto
1007	Dr. Strange	Dr. Stephen Strange	Cloak of Levitation

Normal Forms – 2NF

- Verify table has Primary Key
- Ensure that the values in each column of a table are atomic.

SuperheroId	SuperheroName	AlterEgo
1000	IronMan	Tony Stark
1001	Black Widow	Natasha Romanoff
1002	Thor	
1003	Wasp	Hope van Dyne
1004	Dr. Strange	Dr. Stephen Strange

SuperheroID	Gadget
1000	Arc Reactor
1000	Ironman outfit
1002	Mjolnir
1002	Stormbreaker
1003	Wasp Outfit
1005	Eye of Agamotto
1005	Cloak of Levitation

Normal Forms – 3NF

- Table is in 2NF
- There are no transitive dependencies

Functional Dependency

SuperheroId	SuperheroName	AlterEgo	Superhero Nationality	Gadget
1000	IronMan	Tony Stark	United States	Arc Reactor
1001	IronMan	Tony Stark	United States	Ironman outfit
1002	Black Widow	Natasha Romanoff	Soviet Union	
1003	Thor		Asgard	Mjolnir
1004	Thor		Asgard	Stormbreaker
1005	Wasp	Hope van Dyne	United States	Wasp Outfit
1006	Dr. Strange	Dr. Stephen Strange	United States	Eye of Agamotto
1007	Dr. Strange	Dr. Stephen Strange	United States	Cloak of Levitation

Gadget -> Superhero
   if you know the gadget you can determine the superhero

Functional Dependency

SuperheroId	SuperheroName	AlterEgo	Superhero Nationality	Gadget
1000	IronMan	Tony Stark	United States	Arc Reactor
1001	IronMan	Tony Stark	United States	Ironman outfit
1002	Black Widow	Natasha Romanoff	Soviet Union	
1003	Thor		Asgard	Mjolnir
1004	Thor		Asgard	Stormbreaker
1005	Wasp	Hope van Dyne	United States	Wasp Outfit
1006	Dr. Strange	Dr. Stephen Strange	United States	Eye of Agamotto
1007	Dr. Strange	Dr. Stephen Strange	United States	Cloak of Levitation

Superhero -> Nationality
    the superhero attribute determines the nationality but not the other way, just because we know a nationality - we can't determine the superhero

Transitive Dependency

SuperheroId	SuperheroName	AlterEgo	Superhero Nationality	Gadget
1000	IronMan	Tony Stark	United States	Arc Reactor
1001	IronMan	Tony Stark	United States	Ironman outfit
1002	Black Widow	Natasha Romanoff	Soviet Union	
1003	Thor		Asgard	Mjolnir
1004	Thor		Asgard	Stormbreaker
1005	Wasp	Hope van Dyne	United States	Wasp Outfit
1006	Dr. Strange	Dr. Stephen Strange	United States	Eye of Agamotto
1007	Dr. Strange	Dr. Stephen Strange	United States	Cloak of Levitation

Gadget -> Nationality
   If we know the gadget we can determine the Superhero's nationality using the Superhero name

Remove Transitive Dependency

SuperheroId	SuperheroName	AlterEgo	CountryID
S1000	IronMan	Tony Stark	C1000
S1001	Black Widow	Natasha Romanoff	C1001
S1002	Thor		C1002
S1003	Wasp	Hope van Dyne	C1000
S1004	Dr. Strange	Dr. Stephen Strange	C1000

GadgetID	Gadget	SuperheroID
G1000	Arc Reactor	S1000
G1001	Ironman outfit	S1000
G1002	Mjolnir	S1002
G1003	Stormbreaker	S1002
G1004	Wasp Outfit	S1003
G1005	Eye of Agamotto	S1004
G1006	Cloak of Levitation	S1004

CountryID	Country
C1000	United States
C1001	Soviet Union
C1002	Asgard

Normal Forms – 3.5NF

- Boyce Codd normal form (BCNF)
- Many-to-Many relationships

SuperheroId	SuperheroName	AlterEgo
S1000	IronMan	Tony Stark
S1001	Black Widow	Natasha Romanoff
S1002	Thor	
S1003	Wasp	Hope van Dyne
S1004	Dr. Strange	Dr. Stephen Strange

GadgetID	Gadget
G1000	Arc Reactor
G1001	Ironman outfit
G1002	Mjolnir
G1003	Stormbreaker
G1004	Wasp Outfit
G1005	Eye of Agamotto
G1006	Cloak of Levitation

CountryID	Country
C1000	United States
C1001	Soviet Union
C1002	Asgard

SH_Country_ID	SuperheroID	CountryID
SC1000	S1000	C1000
SC1001	S1001	C1001
SC1002	S1002	C1002
SC1003	S1003	C1000
SC1004	S1004	C1000

SH_Gadget_ID	SuperheroID	GadgetID
SG1000	S1000	G1000
SG1001	S1000	G1001
SG1002	S1002	G1002
SG1003	S1002	G1003
SG1004	S1003	G1004
SG1005	S1004	G1005
SG1006	S1004	G1006

Normalized Questionnaire Model

QAPressureUlcer

- Event_Id: INTEGER (FK)
- SiteLocation: VARCHAR(50)
- OriginalAdmissionDate: DATETIME
- DevelopedWhere: CHAR(1)
- NortonPlusRiskAssessmentScore: INTEGER
- NortonPlusRiskLevel: INTEGER
- QuarterlyAssessmentDate: DATETIME
- MostRecentNortonPlusRiskAssessmentScore: IN...
- MostRecentNortonPlusRiskLevel: INTEGER
- PreventionAddressedRecentMDS: CHAR(1)
- PreventionAddressedCarePlan: CHAR(1)
- HistoryOfPressueUlcers: CHAR(1)
- Community: CHAR(1)
- InHouse: CHAR(1)
- DateLastOccurence: DATETIME
- SiteLastOccurence: VARCHAR(50)
- GoodSkinCare: CHAR(1)
- ConsistentTurning: CHAR(1)
- AdequateNutrition: CHAR(1)
- UtilizesSupportSurfaces: CHAR(1)
- WeeklySkinBodyCompleted: CHAR(1)
- AssessmentDate: DATETIME
- AssessmentDescription: VARCHAR(50)
- MostRecentAssessmentDate: DATETIME
- MostRecentAssessmentDescription: VARCHAR(50)
- IncontinentManagementProgram: CHAR(1)
- SeverePVD: CHAR(1)
- Diabetes: CHAR(1)
- Sepsis: CHAR(1)
- Paraplegia: CHAR(1)
- Quadriplegia: CHAR(1)
- SevereCOPD: CHAR(1)
- ChronicUrinaryIncontinence: CHAR(1)
- ChronicBowelIncontinence: CHAR(1)
- ChronicEndstageRenalLiverHeartDisease: CHAR...
- TerminalCancer: CHAR(1)
- DiseaseorDrugrelatedImmunosuppression: CHAR...
- SteroidTherapy: CHAR(1)
- RadiationTherapy: CHAR(1)
- HeadElevated: CHAR(1)
- Chemotherapy: CHAR(1)
- RenalDialysis: CHAR(1)
- Albumin: CHAR(1)
- Hgb: CHAR(1)
- SerumTransferrin: CHAR(1)
- WeightLoss: CHAR(1)
- RedSwollenLips: CHAR(1)
- PaleSkin: CHAR(1)
- PoorSkinTurgor: CHAR(1)

QAMedicationError

- Event_Id: INTEGER (FK)
- DiagnosisOfResident: CHAR(1)
- DiagnosisStatement: TEXT
- DateOfDiscovery: DATETIME
- DateOfError: DATETIME
- SeenByPhysician: CHAR(1)
- SeenByPhysicianDate: DATETIME
- SeenByPhysicianName: VARCHAR(50)
- SeenByPhysicianWhere: VARCHAR(50)
- PersonError1Name: VARCHAR(50)
- PersonError1Title: VARCHAR(50)
- PersonError1Department: VARCHAR(50)
- PersonError2Name: VARCHAR(50)
- PersonError2Title: VARCHAR(50)
- PersonError2Department: VARCHAR(50)
- PersonError3Name: VARCHAR(50)
- PersonError3Title: VARCHAR(50)
- PersonError3Department: VARCHAR(50)
- Drug1Name: VARCHAR(50)
- Drug1Strength: VARCHAR(50)
- Drug1Quantity: VARCHAR(50)
- Drug2Name: VARCHAR(50)
- Drug2Strength: VARCHAR(50)
- Drug2Quantity: VARCHAR(50)
- Drug3Name: VARCHAR(50)
- Drug3Strength: VARCHAR(50)
- Drug3Quantity: VARCHAR(50)
- BriefDescriptionByPersonWhoDiscovered: TEXT
- AdditionDescriptionByErrorPerson: TEXT
- PrescribedIncorrectlyByMD: CHAR(1)
- PrescribedMDName: VARCHAR(50)
- WrongResident: CHAR(1)
- WrongTime: CHAR(1)
- WrongMedication: CHAR(1)
- WrongDose: CHAR(1)
- WrongRoute: CHAR(1)
- DispensedWrongFromPharmacy: CHAR(1)
- Omission: CHAR(1)
- KindOfErrorOther: CHAR(1)
- KindOfErrorOtherText: VARCHAR(50)
- DidNotCheckOrder: CHAR(1)
- DidNotSignForMedicationGiven: CHAR(1)
- OrderNotPickedUp: CHAR(1)
- OrderIncorrectlyTranscribed: CHAR(1)
- OrderWrittenImproperly: CHAR(1)
- ProceduralBreakdownOther: CHAR(1)
- ProceduralBreakdownOtherText: VARCHAR(50)
- NoChange: CHAR(1)
- ChangeNoMedicalIntervention: CHAR(1)
- Life Threatening: CHAR(1)

QAMechanical

- Event_Id: INTEGER (FK)
- TypeOfEquipmentInvolved: TEXT
- EquipmentLockedOut: CHAR(1)
- EquipmentOwned: CHAR(1)
- EquipmentPreventativeMaintenance: CHAR(1)
- LastPreventativeMaintenanceCheck: DATETIME
- PreventativeMaintenancePerson: VARCHAR(50)
- PreventativeMaintenanceWhyNot: VARCHAR(50)
- Manufacturer: VARCHAR(50)
- Supplier: VARCHAR(50)
- Model: VARCHAR(50)
- SerialNumber: VARCHAR(50)
- AdditionalComments: TEXT
- LossReported: CHAR(1)
- ReportedToRiskManagement: CHAR(1)
- Status: CHAR(1)
- DateCompleted: DATETIME
- ModifiedBy: VARCHAR(50)
- ModifiedDate: DATETIME
- QAMechanical_event_id: INTEGER
- InterventionsAddedAfterDiscovered: TEXT
- SummaryResidentInterview: TEXT
- SummaryWitnessInterviews: TEXT
- ActionsTaken: TEXT
- ChangeInConditionDocumentationInitiated: CH...
- KardexUpdated: CHAR(1)
- AddedTo24HourReport: CHAR(1)
- OwnedOrLeased: CHAR(1)

QAUnknownOrigin

- event_id: INTEGER (FK)
- InterventionsAddedAfterDiscovered: TEXT
- SocialServicesProvided: CHAR(1)
- PsychServicesProvided: CHAR(1)
- SummaryResidentInterview: TEXT
- SummaryResidentsRommateInterview: TEXT
- SummaryResidentsFamilyInterview: TEXT
- SummaryPossibleContactInterview: TEXT
- SubstantiateAbuse: CHAR(1)
- SubstantiateAbuseStatement: TEXT
- ActionsTaken: TEXT
- RootCause: TEXT
- Status: CHAR(1)
- ChangeInConditionDocumentationInitiated: CH...
- KardexUpdated: CHAR(1)
- AddedTo24HourReport: CHAR(1)
- DateCompleted: DATETIME
- ModifiedBy: VARCHAR(50)
- ModifiedDate: DATETIME
- QAUnknownOrigin_event_id: INTEGER

QAElope

- Event_Id: INTEGER (FK)
- DateLastSeen: DATETIME
- DateDiscoveredMissing: DATETIME
- WhoDiscovered: VARCHAR(50)
- MissingNotifications: CHAR(1)
- ListMissingNotifications: TEXT
- DateResidentReturned: DATETIME
- ResidentFoundWhere: VARCHAR(50)
- WhoFoundResident: VARCHAR(50)
- ReturnedNotifications: CHAR(1)
- ListReturnNotifications: TEXT
- MedicationsAFactor: CHAR(1)
- ReturnAssessmentCompleted: CHAR(1)
- ReturnResidentCondition: TEXT
- HistoryOfWandering: CHAR(1)
- RestraintsInUse: CHAR(1)
- WanderingSystemInUse: CHAR(1)
- WanderingSystemFunctional: CHAR(1)
- WanderingSystemStatement: TEXT
- PreAdmissionCompleted: CHAR(1)
- PreAdmissionStatement: TEXT
- IdentifiedAsWandering: CHAR(1)
- RiskFormCompleted: CHAR(1)
- PlacedInElopementBinder: CHAR(1)
- Status: CHAR(1)
- DateCompleted: DATETIME
- ModifiedBy: VARCHAR(50)
- ModifiedDate: DATETIME
- QAElope_event_id: INTEGER
- DateOfLastEvaluation: DATE
- PreventativeMeasures: TEXT
- ResidentDoingPriorToElopement: TEXT
- ExitDoor: CHAR(1)
- ExitDoorAlarmPresent: CHAR(1)
- ExitDoorAlarmFunctioning: CHAR(1)
- ExitWindow: CHAR(1)
- ExitWindowHeightWidthOfOpening: VARCHAR(25)
- ResidentFound: CHAR(1)
- ResidentNotFoundStatement: TEXT
- ResidentReturnToCenter: CHAR(1)
- ResidentNotReturnedStatement: TEXT
- CarePlanUpdated: CHAR(1)
- EvidenceOfAcuteChange: CHAR(1)
- EvidenceOfAcuteChangeStatement: TEXT
- SummaryResidentInterview: TEXT
- SummaryWitnessInterviews: TEXT
- SummaryAssignedNurseInterview: TEXT
- ActionsTaken: TEXT
- RootCause: TEXT
- ChangeInConditionDocumentationInitiated: CH...

QAFall

- event_id: INTEGER (FK)
- EvidenceHypotension: CHAR(1)
- ChangeInVitals: CHAR(1)
- PositionBeforeEventOccured: VARCHAR(2)
- PositionBeforeEventOccuredOther: VARCHAR(50)
- ResidentDoing: VARCHAR(2)
- ResidentDoingTransferringFromTo: VARCHAR(50)
- FallRelatedToPositioning: CHAR(1)
- FallRelatedToPositioningStatement: TEXT
- FallDueToAmbulationStatus: CHAR(1)
- FallDueToAmbulationStatusStatement: TEXT
- AlertMentalStatus: CHAR(1)
- LethargicMentalStatus: CHAR(1)
- ConfusedMentalStatus: CHAR(1)
- AgitatedMentalStatus: CHAR(1)
- SedatedMentalStatus: CHAR(1)
- RecentChangeInMentalStatus: CHAR(1)
- DecreasedCognitionMentalStatus: CHAR(1)
- OtherMentalStatus: CHAR(1)
- OtherMentalStatusText: VARCHAR(50)
- ChangeCognitionBehavior: CHAR(1)
- IsAgitated: CHAR(1)
- IsRestless: CHAR(1)
- HasHallucinations: CHAR(1)
- IsCombative: CHAR(1)
- HadRecentDecline: CHAR(1)
- IsSunDowning: CHAR(1)
- OtherChange: CHAR(1)
- OtherChangeText: VARCHAR(50)
- Antipsychotics: CHAR(1)
- AntianxietyHypnotics: CHAR(1)
- Antidepressants: CHAR(1)
- HypoglycemicAgents: CHAR(1)
- Narcotics: CHAR(1)
- CardiovascularMeds: CHAR(1)
- Laxatives: CHAR(1)
- AntiparkinsonianMeds: CHAR(1)
- Antihistamines: CHAR(1)
- Antihypertensives: CHAR(1)
- AnticonvulsantMeds: CHAR(1)
- Diuretics: CHAR(1)
- MedicationNone: CHAR(1)
- AdministeredPriorToFall: CHAR(1)
- MedicationRelatedToFall: CHAR(1)
- MedicationSideEffects: CHAR(1)
- DizzinessVertigo: CHAR(1)
- Fatigue: CHAR(1)
- OtherMedicationSideEffects: CHAR(1)
- OtherMedicationSideEffectsText: CHAR(50)
- Spills: CHAR(1)

Committing Spreadsheet

EventID	Event Attributes		DeptID	DepartmentName
E1000			D1000	Administration
E1001			D1001	Nursing
			D1002	Maintenance
			D1003	Human Resources

Event_Dept_ID	EventID	DeptID
ED1000	E1000	D1000
ED1001	E1000	D1001
ED1002	E1000	D1003
ED1003	E1001	D1003

Many To Many
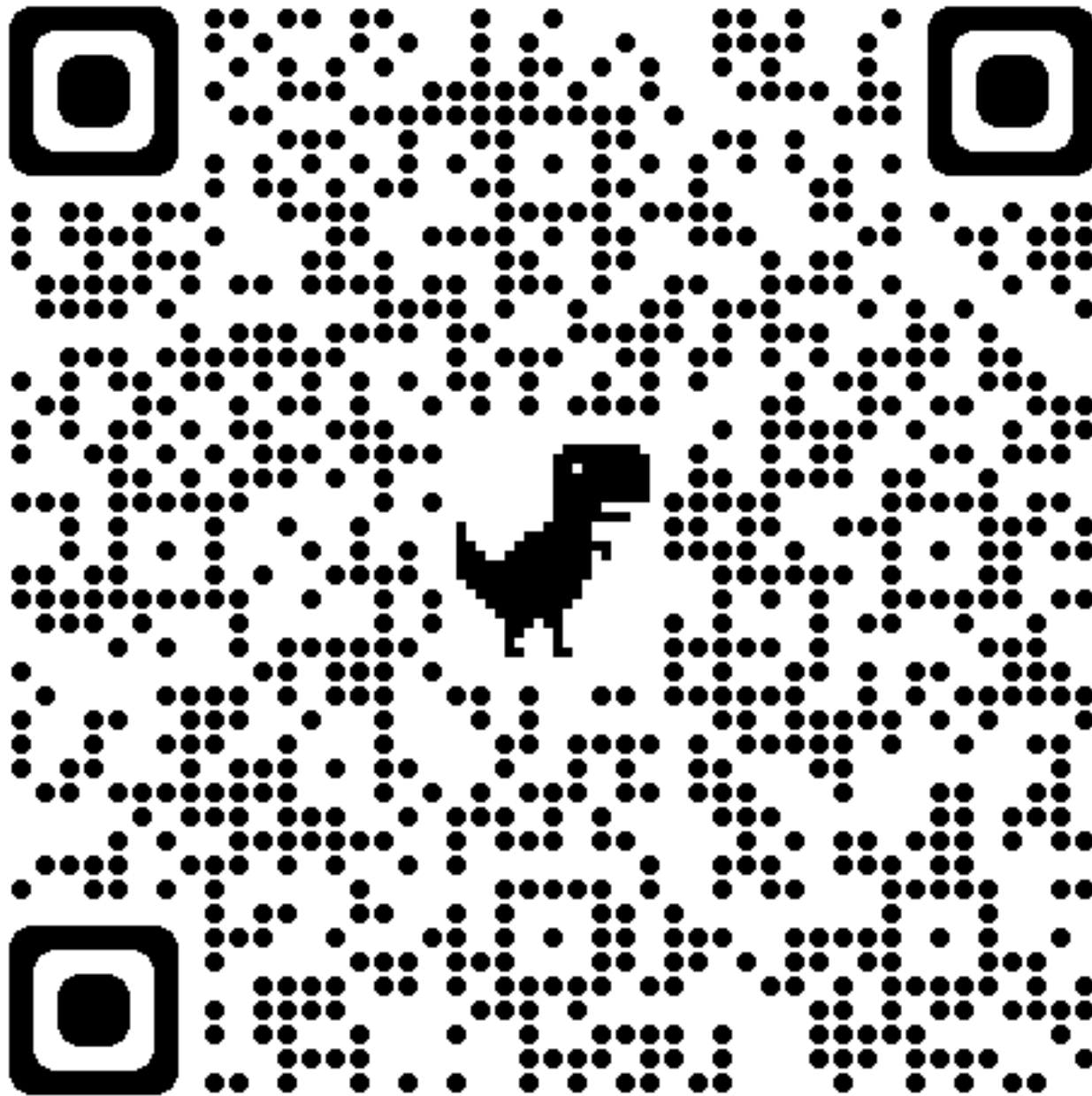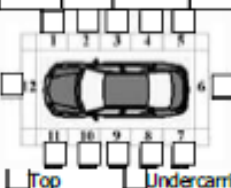
ANALYSIS ACTIVITY

State of New Mexico
Uniform Crash Report

State of New Mexico Uniform Crash Report

http://nmtrafficrecords.com/wp-content/uploads/Uniform-Crash-Report-Fillable_11.19.18-Protected-2.pdf

REPORTING DEPARTMENT

| | ☐ ON PRIVATE PROPERTY | ☐ FATAL ☐ INJURY | PROPERTY DAMAGE ONLY | ☐ UNDER $500 ☐ $500 OR MORE | ☐ HIT AND RUN | **TOTAL NUMBER OF VEHICLES:** | **Case Number:** |

NMDOT: **CAD Num:**

| CRASH DATE (MM/DD/YY) | MILITARY TIME | CITY OCCURRED IN | COUNTY |

Sun	M	Tu	W	Th	F	S	OCCURRED ON: (Route No. or Name)	AT INTERSECTION WITH:	TRIBAL LAND? ☐Yes ☐No
☐	☐	☐	☐	☐	☐	☐			

| OTHER LOCATION | ☐FEET ☐MILES | N ☐ NE ☐ NW ☐ S ☐ SE ☐ SW ☐ E ☐ W ☐ | PERMANENT LANDMARK - COUNTY LINE – INTERSECTION | Milepost | LAT: LONG: |

CRASH OCCURRED ☐On Roadway ☐Off Roadway

CRASH CLASSIFICATION
☐Overturned ☐Rollover ☐Other N-Col ☐R. R. Train ☐Pedestrian ☐Pedalcyclist ☐Other Vehicle ☐Animal ☐Vehicle on Other Rdwy ☐Fixed Object ☐Parked Vehicle ☐Other Object

ANALYSIS CODE:

Vehicle No. 1

| VEHICLE NO. HEADED | 1 | N ☐ NE ☐ NW ☐ S ☐ SE ☐ SW ☐ E ☐ W ☐ | On: | Left Scene of Crash | Posted Speed | Safe Speed |

Drivers Full Name (Last, First, Middle)   Address

| Driver's License Number | State | Type | Status | Restrictions | Endorsements | Expires | Interlock ☐ | City/State | Zip Code | Phone |

| Date of Birth - M/D/YR | Occupation | Seat Pos | Age | Sex (M/F) | Race | Injury Code | OP Code | OP Used Property | Airbag Deploy | Ejected | EMS# | Med Trans |

Seat Pos.	Occupant's Name (Last, First, Middle)	Occupant's Address (City, State, Zip)										

| Vehicle Yr. | Vehicle Make | Color | Body Style | Cargo Body Type | Vehicle Use (1) | Vehicle Use (2) |

Towed? ☐Yes ☐No
Towed due to disabling damage? ☐Yes ☐No

Damage Severity: ☐Heavy ☐Moderate ☐Slight ☐None ☐Unknown ☐All Areas

Extent: ☐Disabled ☐Functional ☐Appearance ☐Property ☐Fire ☐None

☐Top ☐Undercarriage

| License Yr. | State | License Plate Number | VIN |

| DOT # | Interstate Carrier Code | Towed By | Towed To |

| Number of Axles | Vehicle Weight Rating/Gross Combination Weight Rating ☐10,000 lbs. or less ☐10,001 lbs. to 26,000 lbs. ☐Greater than 26,000 lbs. | HazMat Placard | Hazmat Placard 4 digit # | OR | Hazmat Name | AND | 1 digit # | Hazmat Released? ☐Yes ☐No |

| Carrier's Name | Carrier's Address | Carrier's Zip |

| Owner's Name | Owner's Company Name | Owner's Address | Owner's Zip | Owner's Telephone |

| Insured By: (Name of Company) | Policy Number | Trailer or Towed Vehicles (1) | Type | Year | Make | License Yr. | License State | License Number |

| Trailer or Towed Vehicles (2) | Type | Year | Make | License Yr. | License State | License Number | Trailer or Towed Vehicles (3) | Type | Year | Make | License Yr. | License State | License Number |

ROAD – WEATHER

LIGHTING (Check 1)	WEATHER (Check 1)	ROAD COND (Check 1 for each)		ROAD SURFACE (Check 1 for each)		TRAFFIC CONTROL (Check 1 for each)		ROAD CHARACTER (Check 1)
		V1	V2	V1	V2	V1	V2	☐ Straight
☐ Daylight	☐ Clear	☐	☐ Dry	☐	☐ Paved	☐	☐ No Passing Zone	☐ Curve
☐ Dawn	☐ Raining	☐	☐ Wet			☐	☐ Stop Sign	
☐ Dusk	☐ Snowing	☐	☐ Snow	☐	☐ Paved	☐	☐ Traffic Signals	
☐ Dark - Lighted	☐ Fog	☐	☐ Ice			☐	☐ Yield Sign	
	☐ Dust	☐	☐ Loose Material	☐	☐ Paved Center & Edgeline	☐	☐ R.R. Gate	
☐ Dark - Not Lighted	☐ Wind	☐	☐ Other	☐	☐ Unpaved	☐	☐ 4 Way Stop	
☐ Other and not stated	☐ Other	☐	☐ Standing or Moving Water			☐	☐ Flashers	
	☐ Sleet or	☐	☐ Slush			☐	☐ No Controls	
						☐	☐ Other	

GRADE (Check 1): ☐ Level ☐ Hillcrest ☐ On Grade ☐ Dip

Case Number

ROAD DESIGN (Check 1 OR more for each)

V1	V2		V1	V2	
☐	☐	1 Lane	☐	☐	One Way
☐	☐	2 Lanes	☐	☐	Ramp
☐	☐	3 Lanes	☐	☐	Full Access Control
☐	☐	4 + Lanes			
☐	☐	Undivided	☐	☐	Undeveloped
☐	☐	Physical Divider	☐	☐	Alley
☐	☐	Painted	☐	☐	Other
			☐	☐	Constr. Zone

EVENT

APPARENT CONTRIBUTING FACTORS (Check 1 or more for each)

V1	V2		V1	V2		V1	V2	
☐	☐	Excessive Speed	☐	☐	Following too closely	☐	☐	Defective steering
☐	☐	Speed too fast for conditions	☐	☐	Made improper turn	☐	☐	Defective tires
☐	☐	Failed to yield right of way	☐	☐	Driver inattention	☐	☐	Other mech. defect
☐	☐	Passed stop sign	☐	☐	Under influence of alcohol	☐	☐	Road defect
☐	☐	Disregarded traffic signal	☐	☐	Other improper driving	☐	☐	Other No driver error
☐	☐	Drove left of center	☐	☐	Pedestrian error	☐	☐	Traffic control not
☐	☐	Improper overtaking	☐	☐	Inadequate brakes			
☐	☐	Avoid no contact vehicle	☐	☐	Driverless moving vehicle	☐	☐	Improp lane change
☐	☐	Avoid no contact -other	☐	☐	Failed to yield - Police Veh(s)	☐	☐	Improper backing
☐	☐	Cell Phone	☐	☐	Failed to yield – Emrgcy Veh(s)	☐	☐	None
☐	☐	Texting	☐	☐	Under the influence of Drugs	☐	☐	Vehicle Skidded
☐	☐	Low Visibility due to smoke	☐	☐	High speed pursuit			

DRIVERS' ACTIONS (Check 1 or more for each)

V1	V2		V1	V2	
☐	☐	Going Straight	☐	☐	Stopped for traffic
☐	☐	Overtaking /Passing	☐	☐	Stopped for sign/signal
☐	☐	Right Turn	☐	☐	Start in traffic lane
☐	☐	Left Turn			
☐	☐	U Turn	☐	☐	Start from park
☐	☐	Slowing			
☐	☐	Backing	☐	☐	Parked
			☐	☐	Other

SEQUENCE OF EVENTS (See event codes)

V1	V 2
FIRST EVENT	
SECOND EVENT	
THIRD EVENT	
FOURTH EVENT	

DRIVER

DRIVER/PED/PEDALCYCLIST SOBRIETY (Check 1 or more for each with X)

D1	D2	
☐	☐	Consumed Alcohol
☐	☐	Consumed a Controlled Substance
☐	☐	Had Not Consumed Alcohol
☐	☐	Sobriety Unknown
☐	☐	Consumed Medication
☐	☐	Tested by Instrument
☐	☐	Breath Test Administered

_____ gms/210L _____ gms/210L

☐	Blood Test Administered
☐	Standard Field Sobriety Test Administered
☐	Refused Test

DRIVER/PED/PEDALCYCLIST PHYSICAL COND. (Mark 1 or more for each with X)

D1	D2		D1	D2	
☐	☐	Fatigue- Asleep	☐	☐	Medication
			☐	☐	Amputee
☐	☐	Eyesight Imp.	☐	☐	No App. Defects
☐	☐	Hearing Imp.	☐	☐	*Other Physical Impairment
☐	☐	Illness	☐	☐	Unknown

*SPECIFY D 1

*SPECIFY D 2

PEDESTRIAN/PEDALCYCLIST ACTION

PEDESTRIAN

At Intersection		Not at Intersection			
P1	P2	P1	P2	P1	P2
☐ ☐ With Signal		☐ ☐ From Behind Obstruction		☐ ☐ Walking Against Traffic	
☐ ☐ Against Signal				☐ ☐ Standing	
☐ ☐ No Signal		☐ ☐ No Crosswalk		☐ ☐ Pushing or Working on Vehicle	
☐ ☐ Crossing		☐ ☐ Crosswalk		☐ ☐ Playing in Road	
		☐ ☐ Walking W/Traffic			
		☐ ☐ *Other			

*SPECIFY D1

*SPECIFY D2

0000000000

REPORTING DEPARTMENT

| ON PRIVATE PROPERTY | ☐ | FATAL INJURY | PROPERTY DAMAGE ONLY | ☐ UNDER $500 ☐ $500 OR MORE | ☐ HIT AND RUN | **TOTAL NUMBER OF VEHICLES:** | **Case Number:** |

NMDOT: CAD Num:

| CRASH DATE (MM/DD/YY) | MILITARY TIME | CITY OCCURRED IN | COUNTY |

| Sun | M | Tu | W | Th | F | S | OCCURRED ON: (Route No. or Name) | AT INTERSECTION WITH: | TRIBAL LAND? ☐ Yes ☐ No |
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | | | |

| OTHER LOCATION | ☐ FEET ☐ MILES | N NE NW S SE SW E W ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | PERMANENT LANDMARK – COUNTY LINE – INTERSECTION | Milepost | LAT: LONG: |

| CRASH OCCURRED | ☐ On Roadway ☐ Off Roadway | CRASH CLASSIFICATION | ☐ Overturned ☐ Rollover | ☐ Other N-Col ☐ R. R. Train | ☐ Pedestrian ☐ Pedalcyclist | ☐ Other Vehicle ☐ Animal | ☐ Vehicle on Other Rdwy ☐ Fixed Object | ☐ Parked Vehicle ☐ Other Object | ANALYSIS CODE: |

VEHICLE

| VEHICLE NO. HEADED | 1 | N NE NW S SE SW E W ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ | On: | Left Scene of Crash | Posted Speed | Safe Speed |

PERSON – Driver

| Drivers Full Name (Last, First, Middle) | Address |

| Driver's License Number | State | Type | Status | Restrictions | Endorsements | Expires | Interlock ☐ | City/State | Zip Code | Phone |

| Date of Birth - M/D/YR | Occupation | Seat Pos | Age | Sex (M/F) | Race | Injury Code | OP Code | OP Used Property | Airbag Deploy | Ejected | EMS# | Med Trans |

PERSON – Occupants

Seat Pos.	Occupant's Name (Last, First, Middle)	Occupant's Address (City, State, Zip)										

Vehicle No. 1

VEHICLE

| Vehicle Yr. | Vehicle Make | Color | Body Style | Cargo Body Type | Vehicle Use (1) | Vehicle Use (2) | Towed? ☐ Yes ☐ No | Damage Severity ☐ Heavy ☐ Moderate ☐ Slight ☐ None ☐ Unknown ☐ All Areas | Extent ☐ Disabled ☐ Functional ☐ Appearance ☐ Property ☐ Fire ☐ None |

| License Yr. | State | License Plate Number | VIN | Towed due to disabling damage? ☐ Yes ☐ No | ☐ Top ☐ Undercarriage |

| DOT # | Interstate Carrier Code | Towed By | Towed To |

| Number of Axles | Vehicle Weight Rating/Gross Combination Weight Rating ☐ 10,000 lbs. or less ☐ 10,001 lbs. to 26,000 lbs. ☐ Greater than 26,000 lbs. | HazMat Placard | Hazmat Placard 4 digit # | OR Hazmat Name | AND 1 digit # | Hazmat Released? ☐ Yes ☐ No |

CARRIER

| Carrier's Name | Carrier's Address | Carrier'sZip |

PERSON – Owner

| Owner's Name | Owner's Company Name | Owner's Address | Owner's Zip | Owner's Telephone |

INSURANCE

| Insured By: (Name of Company) | Policy Number |

TRAILERS

| Trailer or Towed Vehicles (1) | Type | Year | Make | License Yr. | License State | License Number |

| Trailer or Towed Vehicles (2) | Type | Year | Make | License Yr. | License State | License Number |

| Trailer or Towed Vehicles (3) | Type | Year | Make | License Yr. | License State | License Number |

ROAD – WEATHER

Crash Report Number: 0000000000

Case Number:

LIGHTING (Check 1)
- [ ] Daylight
- [ ] Dawn
- [ ] Dusk
- [ ] Dark - Lighted
- [ ] Dark - Not Lighted
- [ ] Other and not stated

WEATHER (Check 1)
- [ ] Clear
- [ ] Raining
- [ ] Snowing
- [ ] Fog
- [ ] Dust
- [ ] Wind
- [ ] Other
- [ ] Sleet or

ROAD COND (Check 1 for each)
V1	V2	
[ ]	[ ]	Dry
	[ ]	Wet
	[ ]	Snow
	[ ]	Ice
[ ]		Loose Material
	[ ]	Other
	[ ]	Standing or Moving Water
	[ ]	Slush

ROAD SURFACE (Check 1 for each)
V1	V2	
[ ]	[ ]	Paved
[ ]	[ ]	Paved
[ ]	[ ]	Paved Center & Edgeline
[ ]	[ ]	Unpaved

TRAFFIC CONTROL (Check 1 for each)
V1	V2	
[ ]	[ ]	No Passing Zone
[ ]	[ ]	Stop Sign
[ ]	[ ]	Traffic Signals
[ ]	[ ]	Yield Sign
[ ]	[ ]	R.R. Gate
[ ]	[ ]	4 Way Stop
[ ]	[ ]	Flashers
[ ]	[ ]	No Controls
[ ]	[ ]	Other

ROAD CHARACTER (Check 1)
- [ ] Straight
- [ ] Curve

GRADE (Check 1)
- [ ] Level
- [ ] Hillcrest
- [ ] On Grade
- [ ] Dip

ROAD DESIGN (Check 1 OR more for each)
V1	V2		V1	V2	
[ ]	[ ]	1 Lane	[ ]	[ ]	One Way
[ ]	[ ]	2 Lanes	[ ]	[ ]	Ramp
[ ]	[ ]	3 Lanes	[ ]	[ ]	Full Access Control
[ ]	[ ]	4 + Lanes			
[ ]	[ ]	Undivided	[ ]	[ ]	Undeveloped
[ ]	[ ]	Physical Divider	[ ]	[ ]	Alley
[ ]	[ ]	Painted	[ ]	[ ]	Other
			[ ]	[ ]	Constr. Zone

EVENT

APPARENT CONTRIBUTING FACTORS (Check 1 or more for each)

V1	V2		V1	V2		V1	V2	
[ ]	Excessive Speed		[ ]	Following too closely		[ ]	Defective steering	
[ ]	Speed too fast for conditions		[ ]	Made improper turn		[ ]	Defective tires	
[ ]	Failed to yield right of way		[ ]	Driver inattention		[ ]	Other mech. defect	
[ ]	Passed stop sign		[ ]	Under influence of alcohol		[ ]	Road defect	
[ ]	Disregarded traffic signal		[ ]	Other improper driving		[ ]	Other No driver error	
[ ]	Drove left of center		[ ]	Pedestrian error		[ ]	Traffic control not	
[ ]	Improper overtaking		[ ]	Inadequate brakes				
[ ]	Avoid no contact vehicle		[ ]	Driverless moving vehicle		[ ]	Improp lane change	
[ ]	Avoid no contact -other		[ ]	Failed to yield - Police Veh(s)		[ ]	Improper backing	
[ ]	Cell Phone		[ ]	Failed to yield – Emrgcy Veh(s)		[ ]	None	
[ ]	Texting					[ ]	Vehicle Skidded	
[ ]	Low Visibility due to smoke		[ ]	High speed pursuit				

DRIVERS' ACTIONS (Check 1 or more for each)

V1	V2		V1	V2	
[ ]	[ ]	Going Straight	[ ]	[ ]	Stopped for traffic
[ ]	[ ]	Overtaking /Passing	[ ]	[ ]	Stopped for sign/signal
[ ]	[ ]	Right Turn	[ ]	[ ]	Start in traffic lane
[ ]	[ ]	Left Turn			
[ ]	[ ]	U Turn	[ ]	[ ]	Start from park
[ ]	[ ]	Slowing			
[ ]	[ ]	Backing	[ ]	[ ]	Parked
			[ ]	[ ]	Other

SEQUENCE OF EVENTS (See event codes)

V1	V 2
FIRST EVENT	
SECOND EVENT	
THIRD EVENT	
FOURTH EVENT	

DRIVER

DRIVER/PED/PEDALCYCLIST SOBRIETY (Check 1 or more for each with X)

D1	D2	
[ ]	[ ]	Consumed Alcohol
[ ]	[ ]	Consumed a Controlled Substance
[ ]	[ ]	Had Not Consumed Alcohol
[ ]	[ ]	Sobriety Unknown
[ ]	[ ]	Consumed Medication
[ ]	[ ]	Tested by Instrument
[ ]	[ ]	Breath Test Administered

_____ gms/210L _____ gms/210L

- [ ] Blood Test Administered
- [ ] Standard Field Sobriety Test Administered
- [ ] Refused Test

DRIVER/PED/PEDALCYCLIST PHYSICAL COND. (Mark 1 or more for each with X)

D1	D2		D1	D2	
[ ]	[ ]	Fatigue-Asleep	[ ]	[ ]	Medication
[ ]	[ ]	Eyesight Imp.	[ ]	[ ]	Amputee
[ ]	[ ]	Hearing Imp.	[ ]	[ ]	No App. Defects
			[ ]	[ ]	*Other Physical Impairment
[ ]	[ ]	Illness	[ ]	[ ]	Unknown

*SPECIFY D1

*SPECIFY D2

PEDESTRIAN/PEDALCYCLIST ACTION

At Intersection			Not at Intersection					
P1	P2		P1	P2		P1	P2	
[ ]	[ ]	With Signal	[ ]	[ ]	From Behind Obstruction	[ ]	[ ]	Walking Against Traffic
[ ]	[ ]	Against Signal	[ ]	[ ]	No Crosswalk	[ ]	[ ]	Standing
[ ]	[ ]	No Signal	[ ]	[ ]	Crosswalk	[ ]	[ ]	Pushing or Working on Vehicle
[ ]	[ ]	Crossing	[ ]	[ ]	Walking W/Traffic	[ ]	[ ]	Playing in Road
			[ ]	[ ]	*Other			

*SPECIFY D1

*SPECIFY D2

Identify the Entities

- Accident/Incident/Event
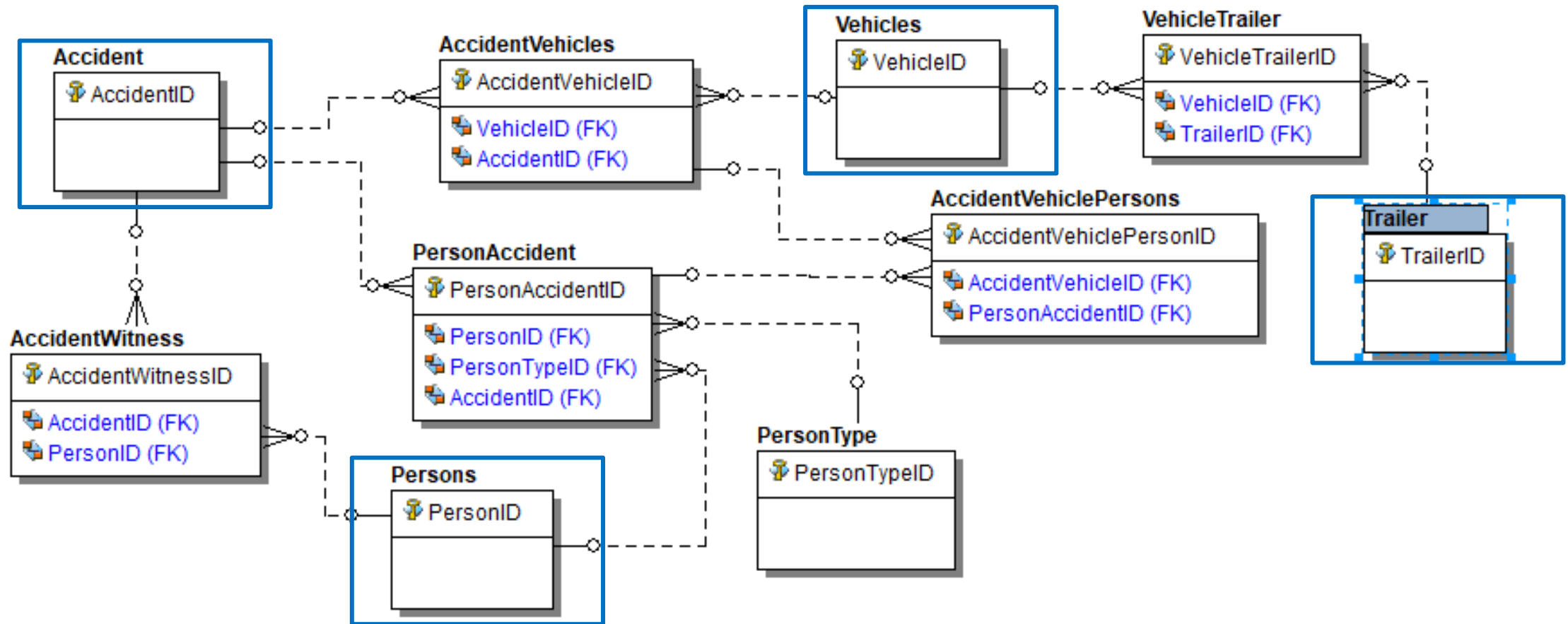- People
- Vehicles
- Trailers

Identify the Relationships

- One to Many Vehicles per Accident
  - Property as Other Involved
- Zero to Many Witnesses per Accident
- One Owner per Vehicle
- Zero to One Driver per Vehicle
  - Pedestrian/Cyclist as Other Involved
- Zero to Many Occupants per Vehicle
- Zero to Many Towed/Trailers per Vehicle

Basic Model

Dimensional Model

The dimensional model separates business process data into fact tables, which hold the measurable, quantitative data about a business, and dimensions which are descriptive attributes related to fact data.

Wikipedia: https://en.wikipedia.org/wiki/Star_schema

Building the Dimensions

Bus Matrix

BUSINESS PROCESSES	Date	Product	Warehouse	Store	Promotion	Customer	Employee
Issue Purchase Orders	X	X	X				
Receive Warehouse Deliveries	X	X	X				X
Warehouse Inventory	X	X	X				
Receive Store Deliveries	X	X	X	X			X
Store Inventory	X	X		X			
Retail Sales	X	X		X	X	X	X
Retail Sales Forecast	X	X		X			
Retail Promotion Tracking	X	X		X	X		
Customer Returns	X	X		X	X	X	X
Returns to Vendor	X	X		X			X
Frequent Shopper Sign-Ups	X			X		X	X

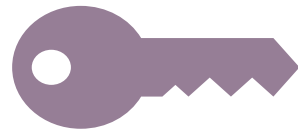COMMON DIMENSIONS

Nothing but the Facts
Grain

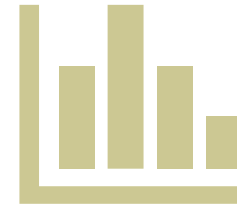Defines what level of detail is observed for a particular event

Multiple Fact tables for the same information at a different Grain

Nothing but the Facts

Foreign Keys to Dimensions

Measures

There can be multiple measures in a single fact table

Types of Measures

- Additive
- Semi-Additive
- Non-Additive

Dimensions

Slowly Changing

- Depending on the business requirement, should an attribute's history of changes be preserved in the data warehouse?
  - Type 1
  - Type 2

Rapidly Changing

Dimensions

Degenerate

- Attribute is stored in the Fact Table, not a separate dimension.

Role Playing

- Same dimension key joined to multiple fields in the fact table

Shrunken

- Aka Snowflake – subset of another dimension

Static

- Attributes not extracted from the data source

Dimensions

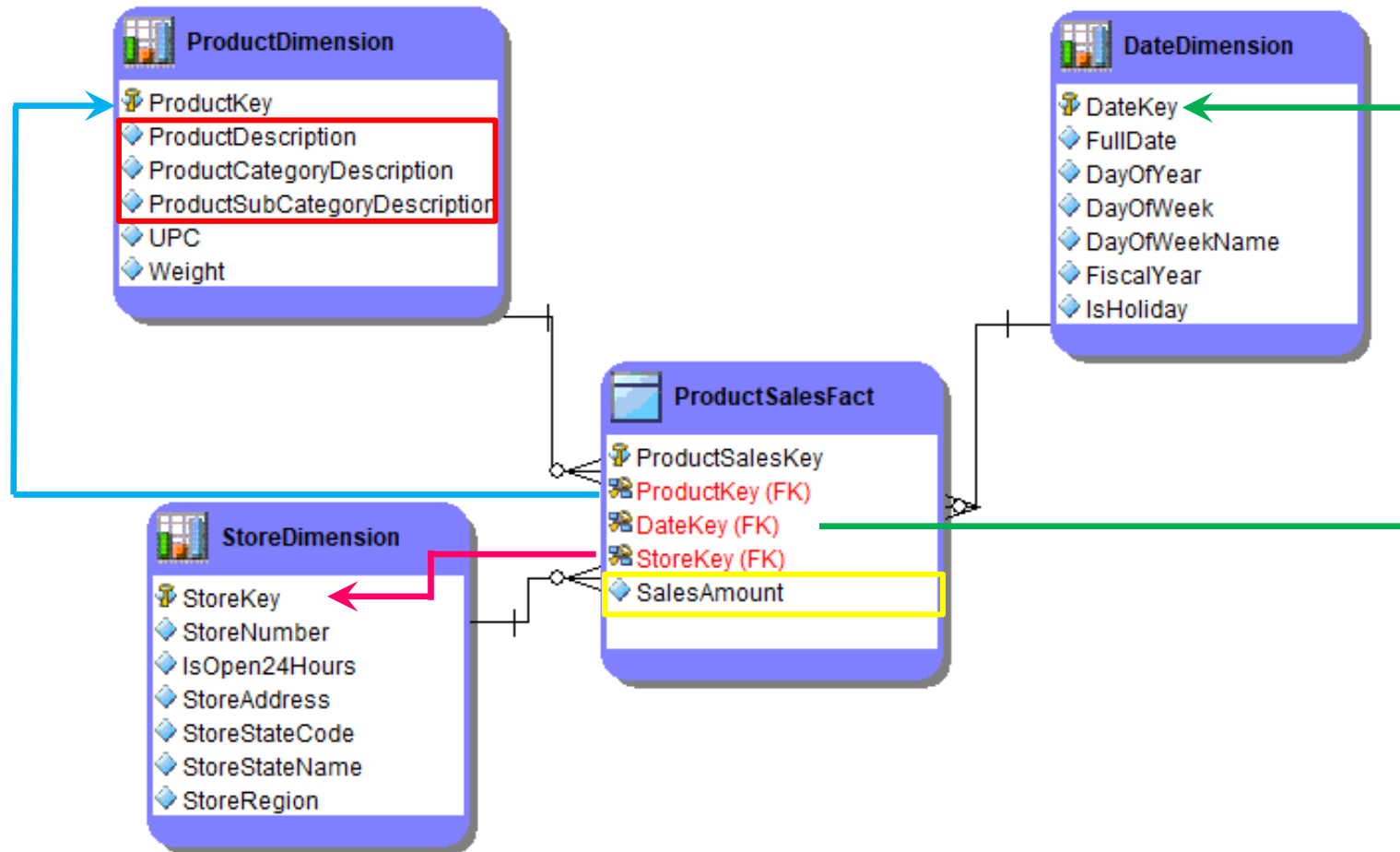**Junk**
- Combination of Unrelated attributes

Inferred
- A surrogate key when dimension record not ready

Conformed
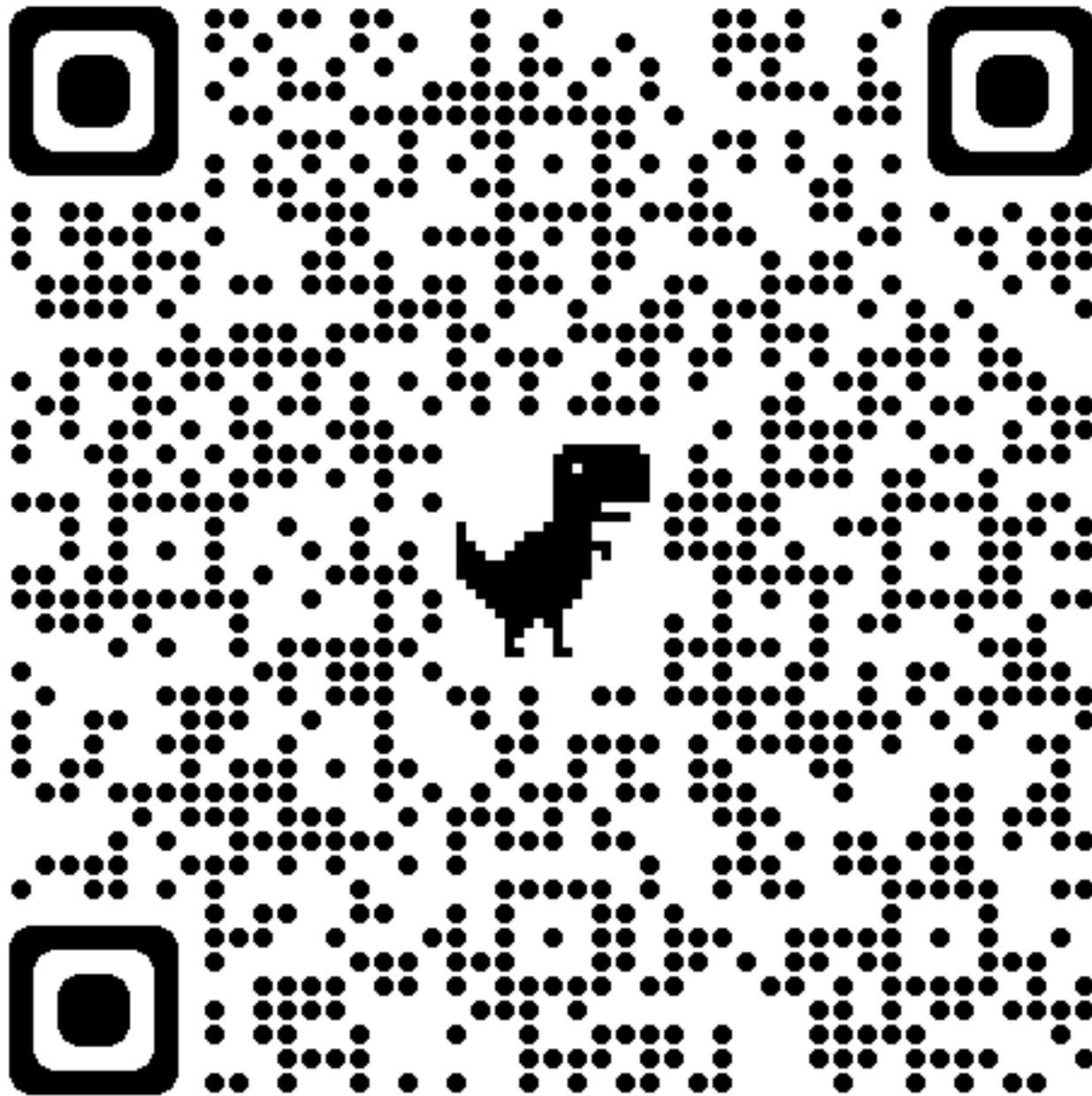- A dimension used in multiple locations

Star Schema

Never more than a single join away from dimensions – all the attributes in very wide tables

ANALYSIS ACTIVITY

State of New Mexico Uniform Crash Report

State of New Mexico Uniform Crash Report

http://nmtrafficrecords.com/wp-content/uploads/Uniform-Crash-Report-Fillable_11.19.18-Protected-2.pdf

Filling a Dimension

ID	Towed	Due to disabling	Severity	Extent
1001	Yes	Yes	Heavy	Disabled
1002	Yes	No	Heavy	Disabled
1003	No	Yes	Heavy	Disabled
1004	No	No	Heavy	Disable
1005	Yes	Yes	Heavy	Functional
1006	Yes	No	Heavy	Functional
1007	No	Yes	Heavy	Functional
1008	No	No	Heavy	Functional

Possible Dimensions

- Vehicle
  - VIN, Year, Model, Make, Color, Body Style, License Plate State Abbreviation, License Plate State Name, License Plate Number, Plate Expiration Date, Number of Axles, Weight Rating, HazMat Placard 4 digit Number, HazMat Name, HazMat 1 digit Number, HazMat Released, Posted Speed, Safe Speed, Left Scene of Crash, Direction Vehicle Headed, Weather, Road Condition, Road Character, Grade of Road

Possible Dimensions

- Accident Details (Junk Dimension)
  - Incident Number/Crash Report Number, Case Number, CAD Number, NMDOT Number, Crash Classification, Hit and Run, Fatal Injury, On Private Property, Lighting, Weather

- Occupant
  - Person Name, Drivers License State Abbreviation, Drivers License State Name, Drivers License Number, Type Of License, License Restrictions, License Endorsement, License Expiration Date, Interlock License, Date of Birth, Occupation, Seat Position

Basic Model
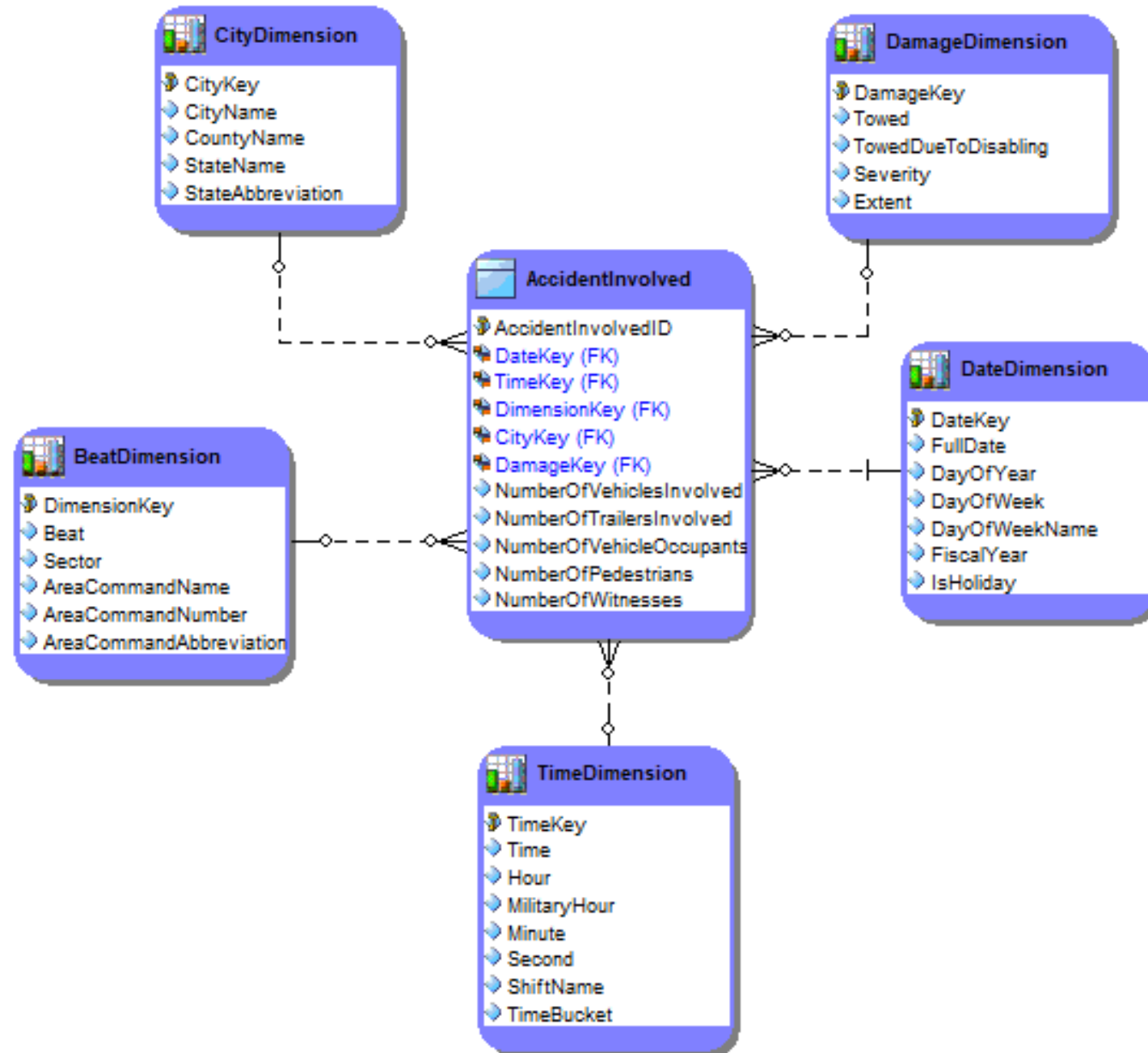
Zsa-zsa of Star Schema?

Using a Third Normal Form Model for an Analysis Process

Bad Modelling that leads to incorrect aggregates
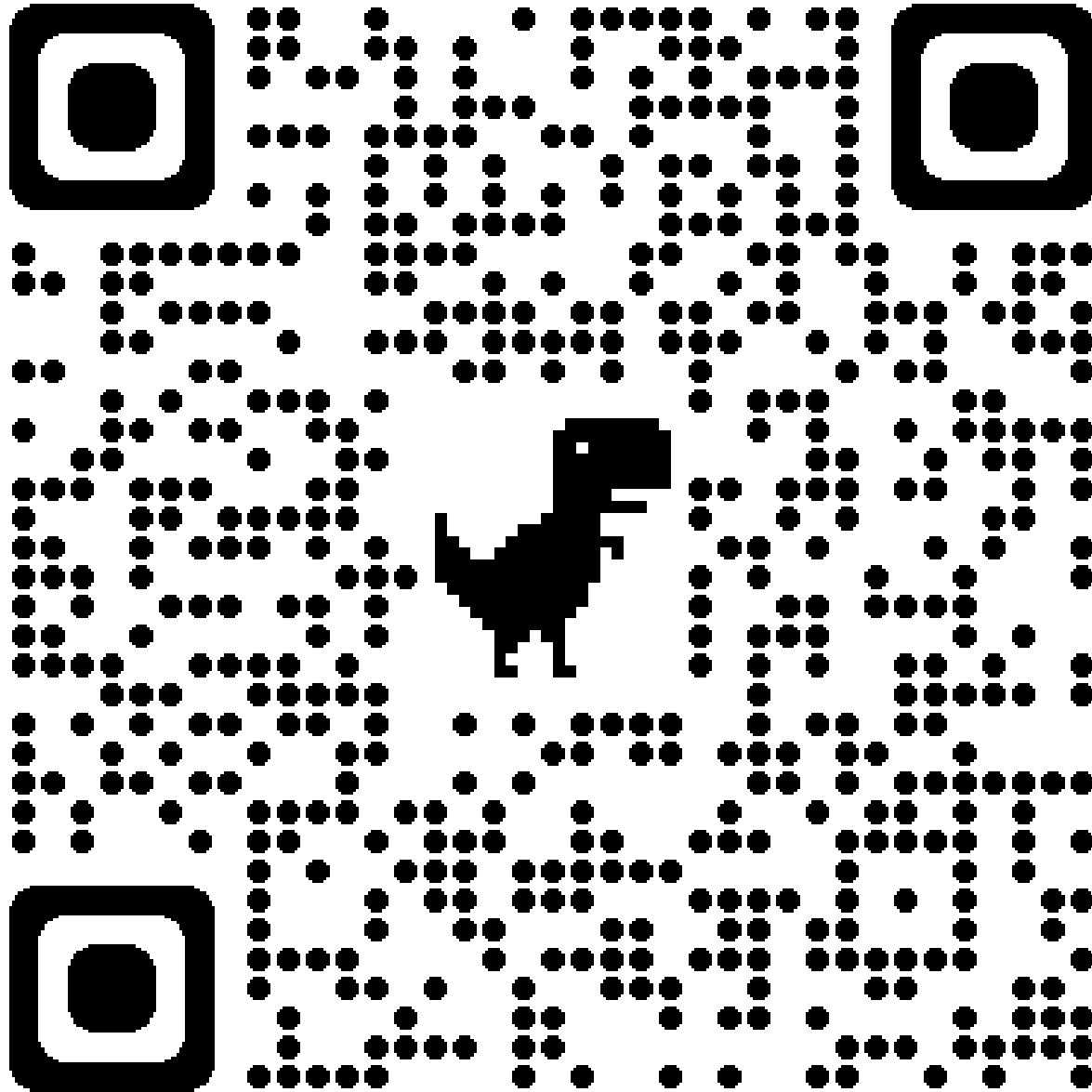
A Perfect Ten

Thank You
Leslie Andrews
@landrews5807

Your Take Away – Determine if the databases you work with were designed using the correct model

3Cloud Current Jobs

Looking for Work?

https://grnh.se/
db603bf72us