Name : Pratik Bharat Tamhankar   **CWID:** A20384093

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Phase 0:

Data Team and its contribution at various stages:
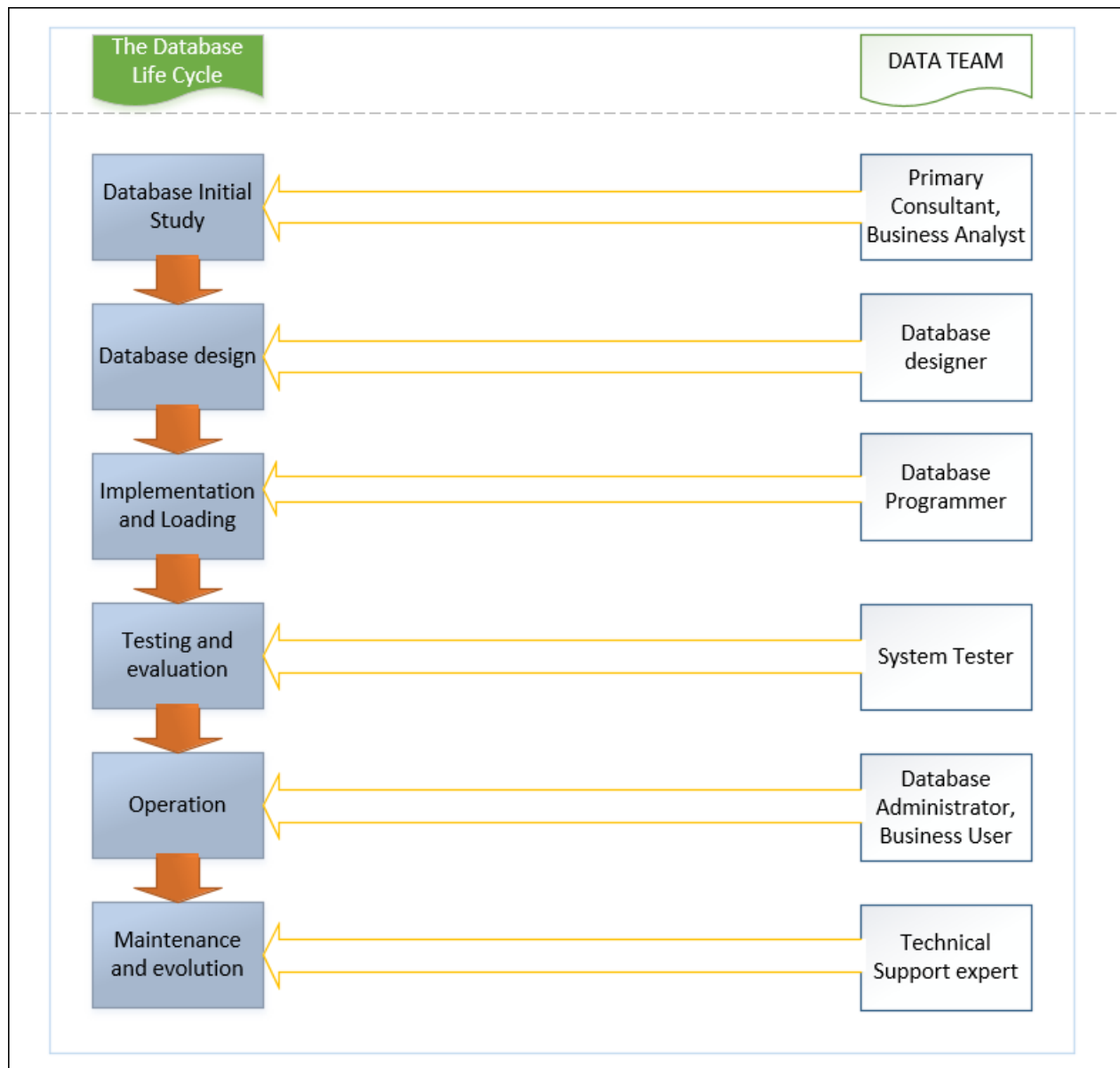
<u>Below are the Data team members and their responsibilities defined descriptively:</u>

<u>1:- Primary consultant:</u>
- Will be descriptively involved in the preliminary study activities for understanding the business functioning and further contribute in listing the business rules.
- Will ensure that all customer requirements are met diligently and shall act as a Pseudo Customer to the internal team

<u>2:- Business Analyst:</u>
- Will be responsible for documenting the business requirements, expected solution drafting and work on a solution model for the customer.
- It's the Business Analyst who will ensure that the requirements being provided by the customer will be concise and add value to the existing business and not incur additional overheads
- Business analyst shall also contribute in figuring out the logical diagram of the system
- Business analyst would be a continuous engaging party with the end customer for ensuring that the requirements documented and solutions finalized are in sync with customer expectations
- Business Analyst shall provide the conceptual designing creation for the organization, which should define the main entities in a model its attributes and relations at business level

<u>3:- Database designer:</u>
- Based on the requirements documented by the Business Analysts, the database designer shall work on creating a logical design of the database
- Database designer shall work descriptively on the Business Rules to ensure that no requirement, implicit/explicit is missed out, interpreted incorrectly or not documented at all
- A database designer shall collate all the requirements descriptively, understand the conceptual diagrams and contribute in creation of logical diagrams, which is a step forward from Conceptual diagram
- A logical diagram, refines the physical models by adding the datatypes, defining the keys and relationships amongst the entities
- It is the primary responsibility of the database designer to map the conceptual diagram to its logical equivalence, database designer works in close co-ordination with Business analyst for this purpose
- A database designer should further design a physical diagram which will represent the actual database conventions in terms of table names, column names, primary keys, foreign keys, constraints if any and so on

<u>4:- Database programmer:</u>
- It's the task of the database programmer to convert the physical model into an actual database schema structure as per the underlying database syntaxes
- Database Programmer is also responsible for writing the code for any specific business operations, which works on the database objects

5:- Database administrator:

- It is the task of database administrator to figure out the sizing needs of the customer, implement the database system and monitor the database activities
- Backup and restoration in case of a system failure is also the responsibility of a database administrator

6:- System tester:

- Should prepare the testing scenarios and review it with the Business Analyst to ensure that all of business requirements documented are implemented correctly in the system
- Once the database developer completes its development and the system is prepared to handle the customer input files/data, a system tester should perform various levels of testing such as unit testing, integration testing, regression testing
- It is the responsibility of a System tester to ensure that the system is bug free and working as per expected

7:- Technical Support Expert:

- Will be responsible for maintaining the system on a state where it performs the desired operations as documented
- Apply the necessary updates, patches and fixes if required and keep the system bug free and running
- Identify the workarounds just in case a permanent solution for an issue isn't available
- Implement the workarounds in a way that it doesn't hamper the system negatively and create a

8:- Business Object Expert:

- Primarily responsible for gathering reporting requirements from the end customer, performing a feasibility study report, present the possible options to the customer along with other value added reports if possible

Phase 1

Questions:

Sr No	Questions	Hypothetical/Sample Answers given
1	What is the approximate number of travel advances prepared/documented per year.	As per last year's report, there were 8000 travel advances issued per year
2	Are there any other teams apart from accounting department who are directly or indirectly connected with the travel advance procedures, if yes, what are the names of these teams and how are they related to the travel advance process	Project Management team is an entity which selects and sends employees
3	What is the current flow of operations or steps which take place for generating the travel advances, how does the process get initiated and where does it end.	NA
4	Is there an expenditure restriction based on the level of employee designation, for example the expenditure limit, type of expenditures, etc. If yes, what are these restrictions/limitations.	No, but an expenditure remittance limit of maximum 5000$ on Cash/Check and 10000$ Traveler's card is applied on every travel advance
5	Can a travel advance issued be rejected, if yes, under which situations can it be possible	In case of Canceled Events
6	Is a travel advance always associated with any specific project, if yes, how can one identify a project, from a travel advance issued	Yes, based on the Project Name
7	What are the types of bills/ supporting documents acceptable for supplementing the expenses claimed	Any bills, provided they fall under travel date, travel location and have a printed date on it
8	What is the initial amount which is given to the employees as a travel advance	NA
9	Is multiple mode of travel advance payments supported? If Yes, what are the different modes of payments available. If not, then what is the mode of payment currently operational for carrying out the processes and is the organization thinking of adding a new mode of payment	Yes, Cash, Check and Traveler's card
10	How does an employee request a travel advance and what is the information he needs to provide while asking for a travel advance	By raising a Request
11	In case, the expenses are higher than the travel	Within 30 days

	advance issues, is there a time limit as till when a re-imbursement for exceeded amount be requested	
12	In case of an underutilized travel advance, can an employee payback the residual amount in parts or the same needs to be paid fully.	Needs to be paid fully
13	Are there any other events other than the Cancelled Events and Outstanding/Non-Submitted report which take place?	No
14	What is the process of travel advance reconciliation which takes place at the end of the month	Comparison between Total expenses submitted and Total travel advance amount issued at an employee, event level
15	Is there a report expected for the same, if yes what should be the mandatory attributes which need to be included in it	Yes

Business Rules:

1. An EMPLOYEE can raise multiple TRAVEL ADVANCE issuance requests
2. Every TRAVEL ADVANCE request raised should have Employee ID of the Employee approving it
3. A TRAVEL ADVANCE raised can have maximum limit of 5000$ CASH and 10000$ as Travel Card
4. A TRAVEL ADAVANCE can be used for below expenditure types only,
   a. Lodging
   b. Meals
   c. Travelling
   d. Business Travel Insurance
   e. Telephone usage
   f. Event registration fees
   g. Others
5. A TRAVEL ADAVANCE can be issued in the form of CASH or TRAVEL CARD options
6. If the EXPENSES are lesser than TRAVEL ADAVANCE issued, the same should be notified to the ACCOUNTS department with the EXPENSE amount and the supporting billing documents, the differential amount shall be deducted from the EMPLOYEE salary account
7. If the EXPENSES are greater than the TRAVEL ADVANCE issued then the ACCOUNTS department should be notified regarding the same and the additional amount can be remitted in the form of paper money, check or reimbursed in the Employee Salary account directly
8. If the EXPENSES are equal to the TRAVEL ADVANCE amount issued than the ACCOUNTING department should be notified regarding it, and the ACCOUNT's department will issue a zero-balance check to close the transaction

9. A travel advance reconciliation process is performed by the ACCOUNTING department, which will be a comparison between the total travel advances issues v/s the total expenses reported back by an employee at the end of every month

10. If after the reconciliation comparison, the balances do no tie then the travel advance should be marked as outstanding

11. There shall be two levels of reconciliation reports generated, Detailed and Summary, a detailed report shall have the Employee level comparison for every Travel Advance issued, while the Summary report should contain the Project level comparisons for a month

12. A TRAVEL ADVANCE can be issued by only the SALES or PURCHASE department employees

13. In case of CANCELLED events, every TRAVEL ADVANCE's issued shall be returned to the ACCOUNT's department within next 30 Days of its cancelation

14. Every TRAVEL ADVANCE issued should be recorded in the system with a unique id travel advance id, employee id, employee id of the person approving the report, Project number, issuance amount, issuance date, department id, employee id of the employee issuing the travel advance and status as mandatory attributes

15. A TRAVEL ADVANCE can be in issued, canceled, outstanding or closed status at any point in time

16. Every TRAVEL ADVANCE issued shall be linked to the request raised by the Employee

Phase 2:

<u>Assumptions:</u>

The below project work is done based on the provided requirements and certain assumptions to help ensure that the Travel Advance Process will be fully automated, scaled and applied at any organization

Below are certain assumptions along with the designed Business Process flow for handling the required operational, reporting and analytic operations

- The Accounts department like any other department will be part of the DEPARTMENT entity, hence any actions/events associated with the Accounts department are generalized under the DEPARTMENT entity
- Every request and response shall be tracked separately in individual entities
- Settlement Details will be separately tracked as separate entity
- An Employee will have its manager details in the EMPLOYEE entity as a separate attribute

Business Process Flow:
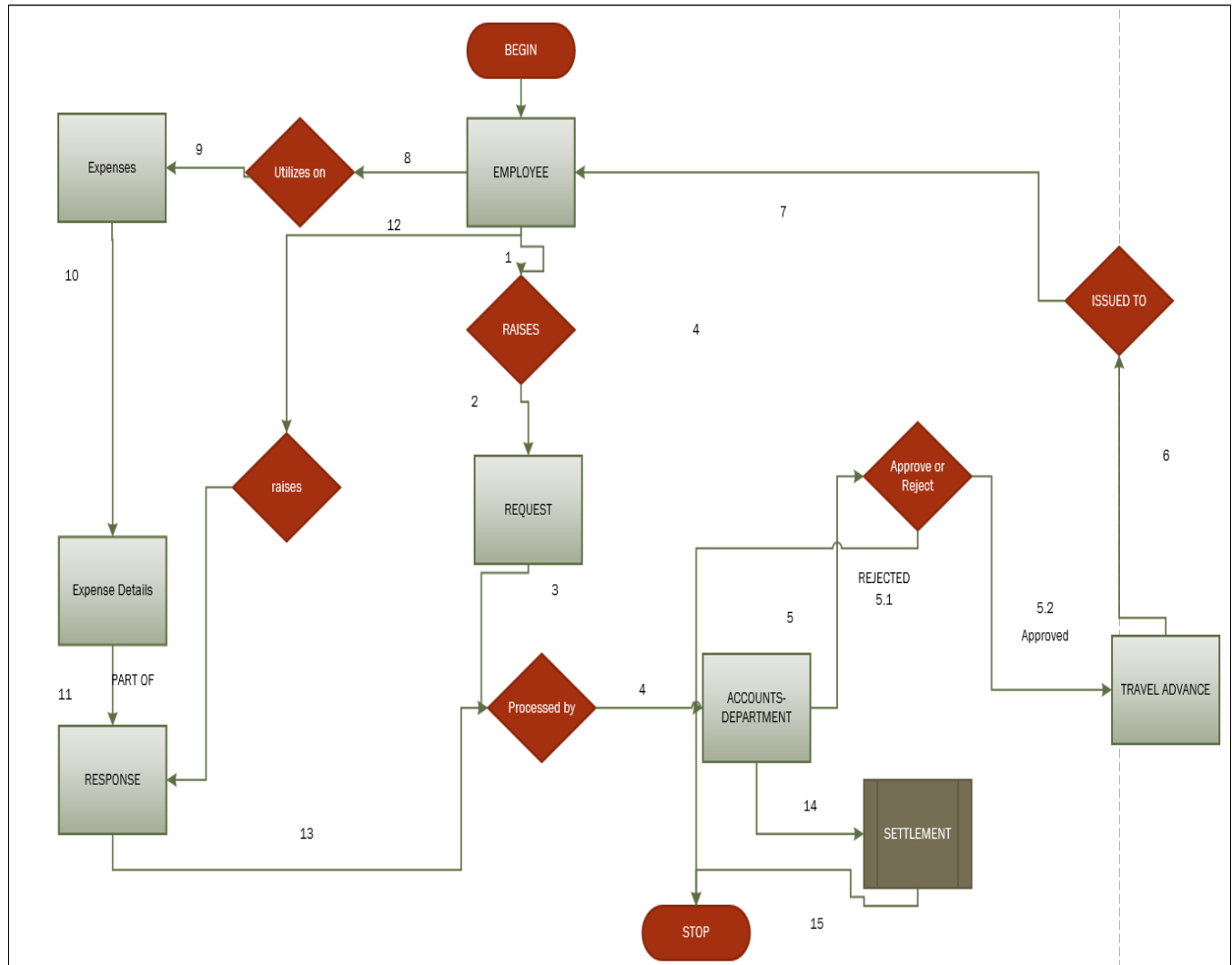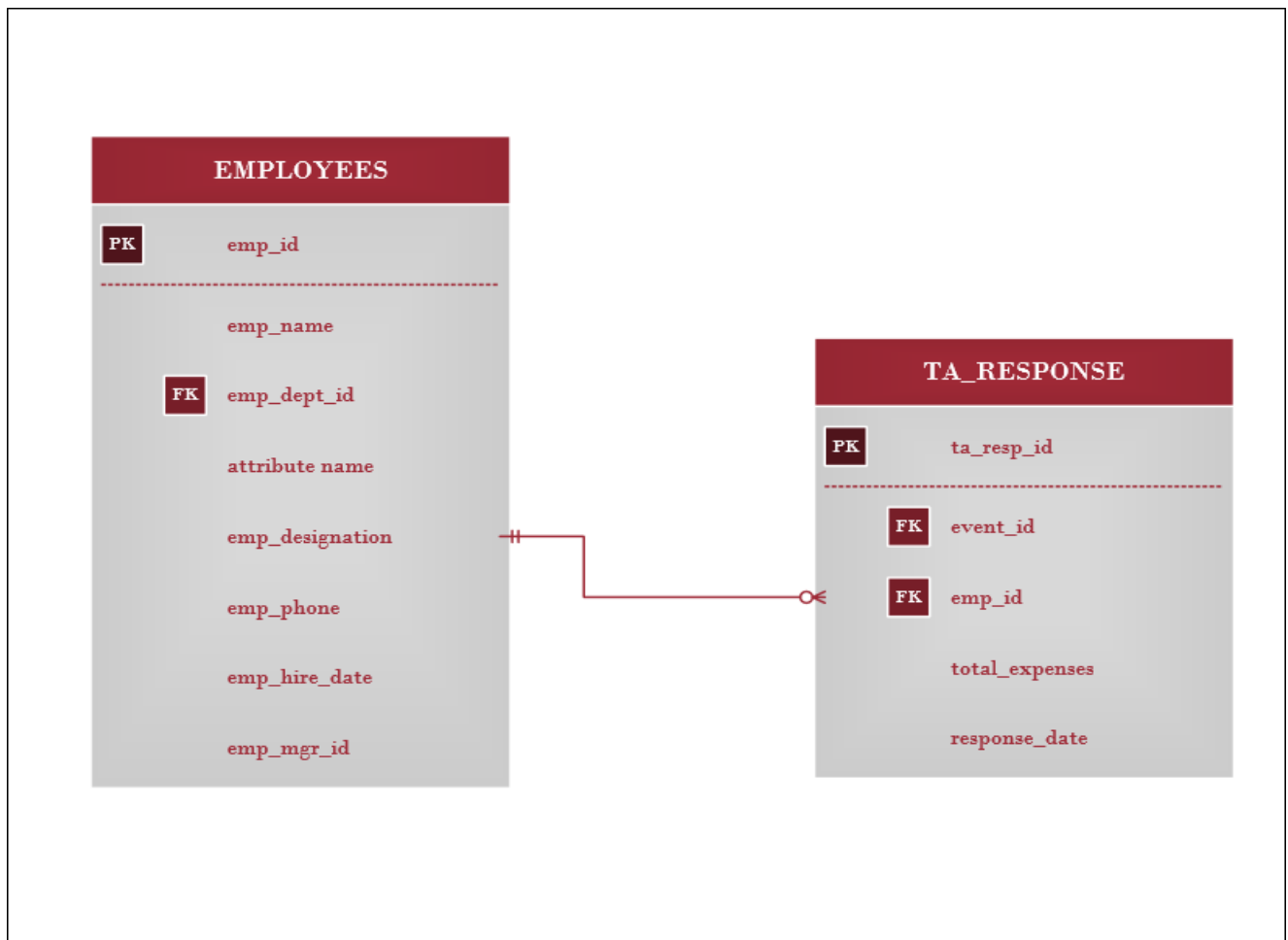
Conceptual Modelling:

Below is the list of Entities along with its attributes based on the Business Rules and reporting requirements:

1. Employees (Emp_ID, Emp_Name, Emp_dept_id, Emp_designation, Emp_phone, Emp_Hire_Date, Emp_Mgr_Id)
2. Department (Dept_Id, Dept_Name, Dept_Loc)
3. Projects(Proj_ID, Proj_Name, Proj_Start_Date, Proj_End_Date, Proj_Mgr_Id, Proj_Cost)
4. Events(Event_Id, Proj_Id, Event_Desc, Event_loc, Event_start_date, Event_end_date, Event_Mgr)
5. Expense details(Exp_Id, Event_Id, Proj_Id,Emp_ID, Exp_type, Exp_desc)
6. TA_Request(TA_Request_Id, Requester_ID, Event_Id, Proj_ID, TA_Remittance_Type, Trvl_strt_date, Trvl_end_date,TA_Apporval_EMP_ID)
7. Travel_Advances(TA_Issuance_Id,TA_Request_Id,Event_Id,TA_strt_date,TA_end_date,TA_Remittance_Type, TA_Amount, TA_Status, Dept_Id)
8. TA_RESPONSE(TA_RESP_ID,Event_Id,Emp_ID,Project_Id,Total_Expenses,Response_Date)
9. Settlement_Details(Set_ID,Set_Event_ID,Set_issuance_ID,Set_Utilization_Type,Set_total_expenses,Set_total_advances,Set_Initiated_Date,Set_last_modified_Date)
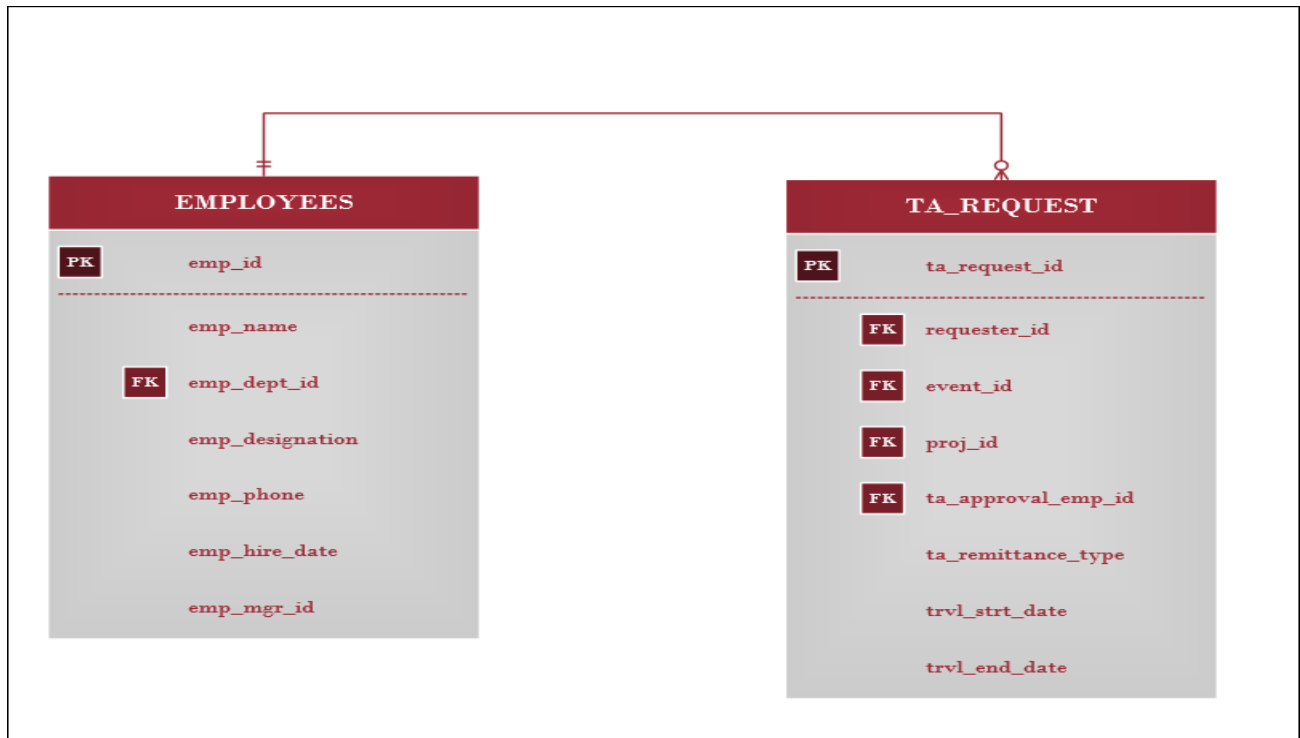
Relationships amongst entities:

Below is the individual relationship diagram amongst any two entities in the Conceptual Schema

1: EMPLOYEE provides RESPONSES:

2: EMPLOYEE raises Travel Advance REQUESTS:

EMPLOYEES

PK	emp_id
	emp_name
FK	emp_dept_id
	emp_designation
	emp_phone
	emp_hire_date
	emp_mgr_id

TA_REQUEST

PK	ta_request_id
FK	requester_id
FK	event_id
FK	proj_id
FK	ta_approval_emp_id
	ta_remittance_type
	trvl_strt_date
	trvl_end_date

3: EMPLOYEES work under PROJECTS:

EMPLOYEES

PK	emp_id
	emp_name
FK	emp_dept_id
	emp_designation
	emp_phone
	emp_hire_date
	emp_mgr_id

PROJECTS

PK	proj_id
	proj_name
	proj_start_date
FK	proj_mgr_id
	proj_cost
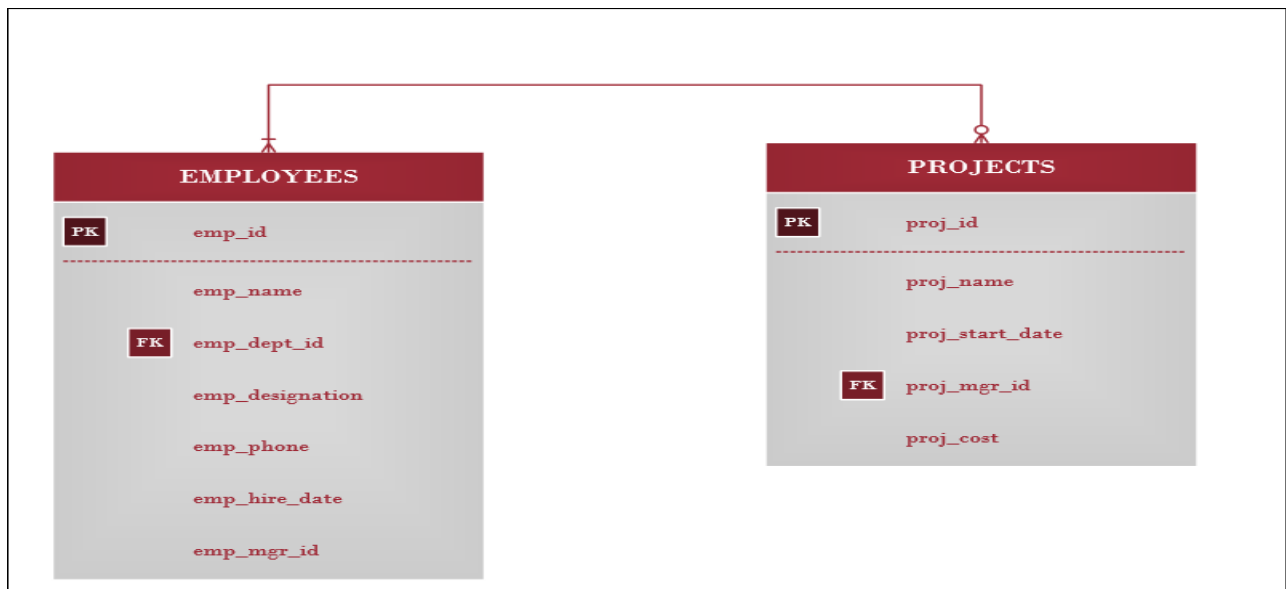
4: EMPLOYEE submits EXPENSE_DETAILS:
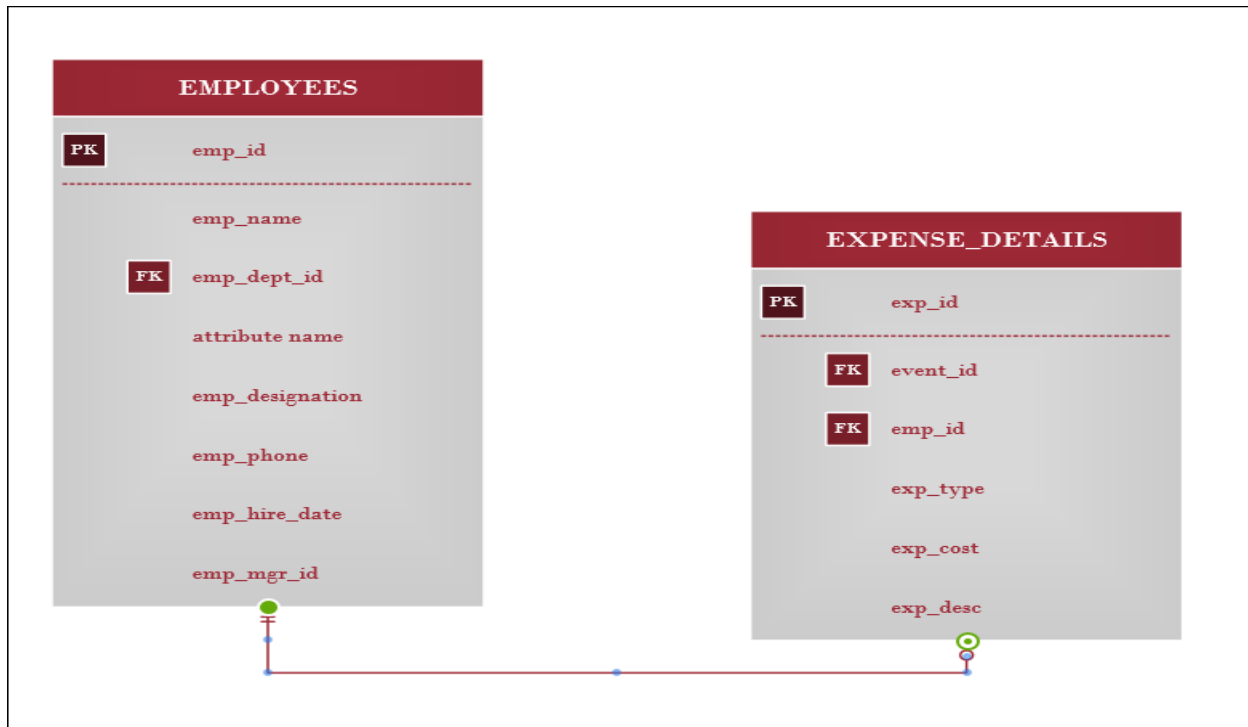
5: EMPLOYEES work for a DEPARTMENT:
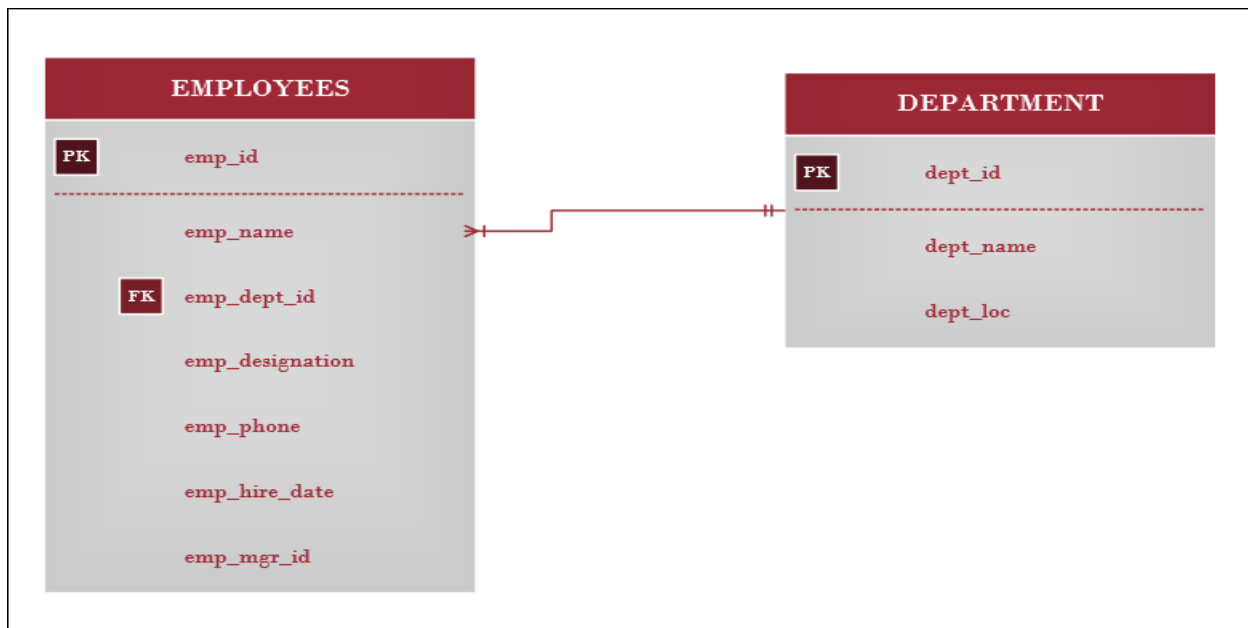
6: TRAVEL_ADVANCES are issued to EMPLOYEES:
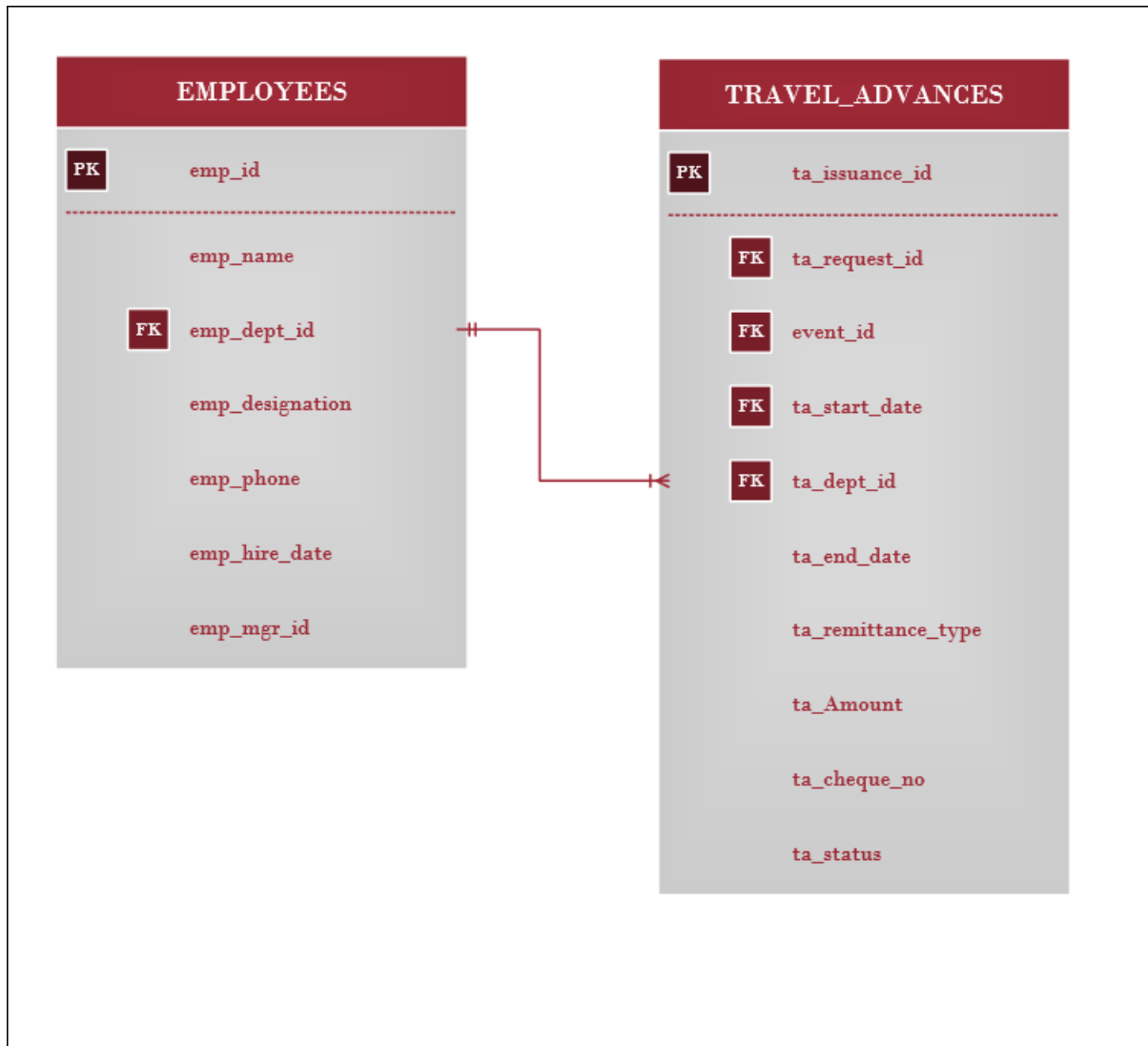
7: Events have settlement details:
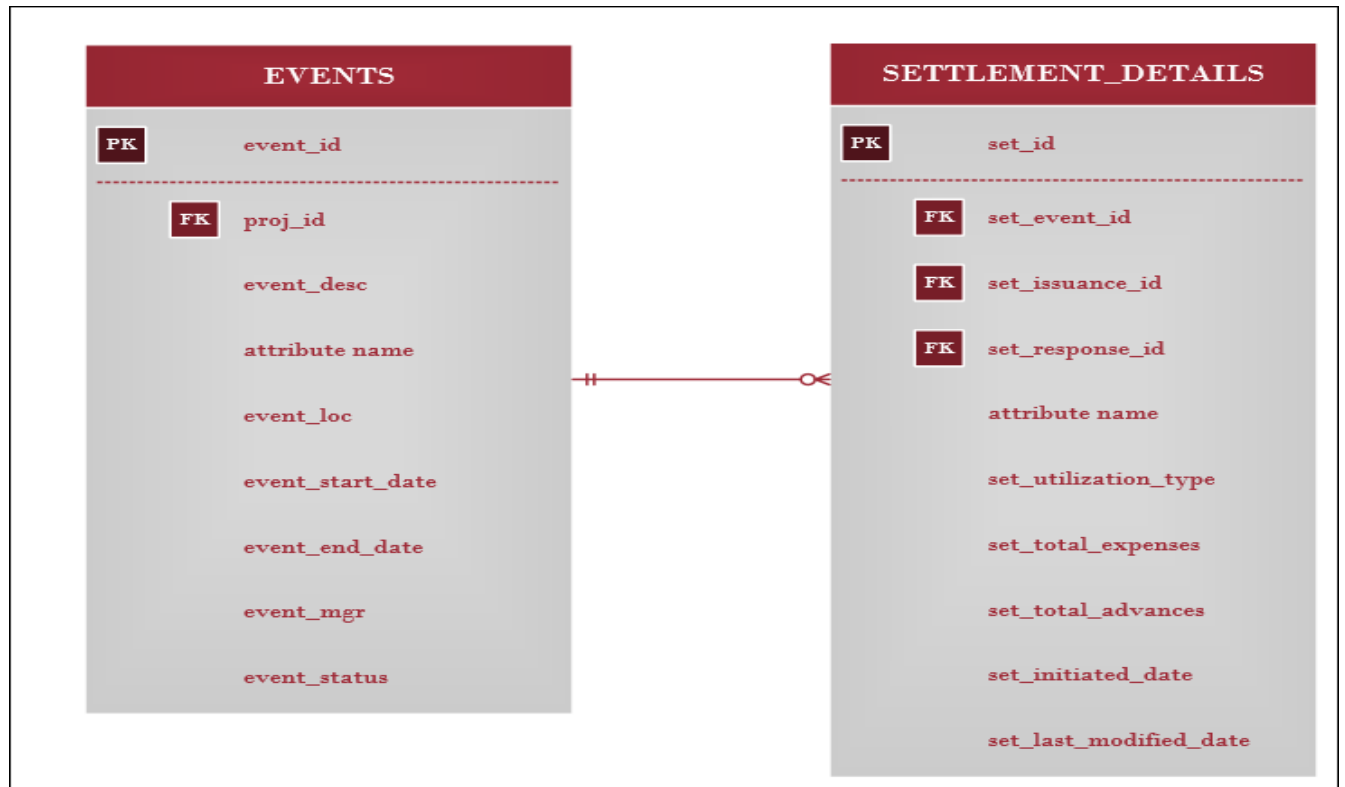
8:Travel Advance Responses are raised for EVENTS:

EVENTS	TA_RESPONSE
PK event_id	**PK** ta_resp_id
FK proj_id	**FK** event_id
event_desc	**FK** emp_id
attribute name	total_expenses
event_loc	response_date
event_start_date	
event_end_date	
event_mgr	
event_status	
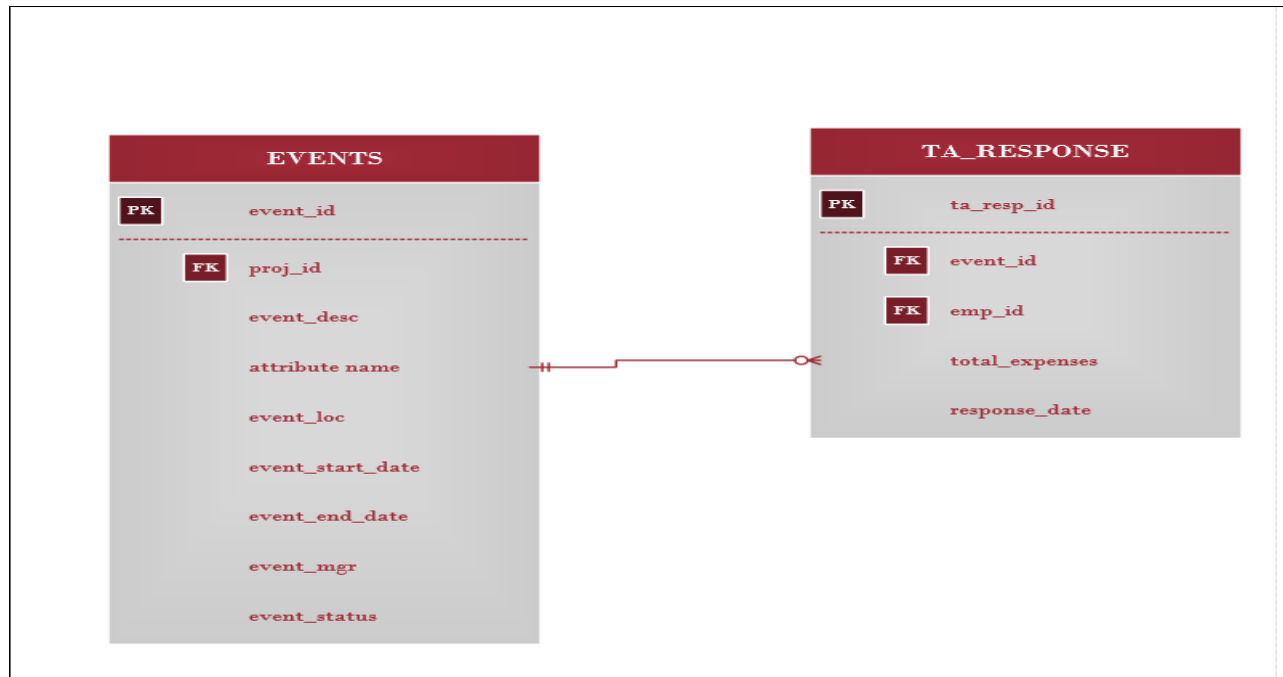
9: TRAVEL ADVANCE requests are raised for events:

EVENTS

PK	event_id
FK	proj_id
	event_desc
	attribute name
	event_loc
	event_start_date
	event_end_date
	event_mgr
	event_status

TA_REQUEST

PK	ta_request_id
FK	requester_id
FK	event_id
FK	ta_approval_emp_id
	ta_remittance_type
	trvl_strt_date
	trvl_end_date
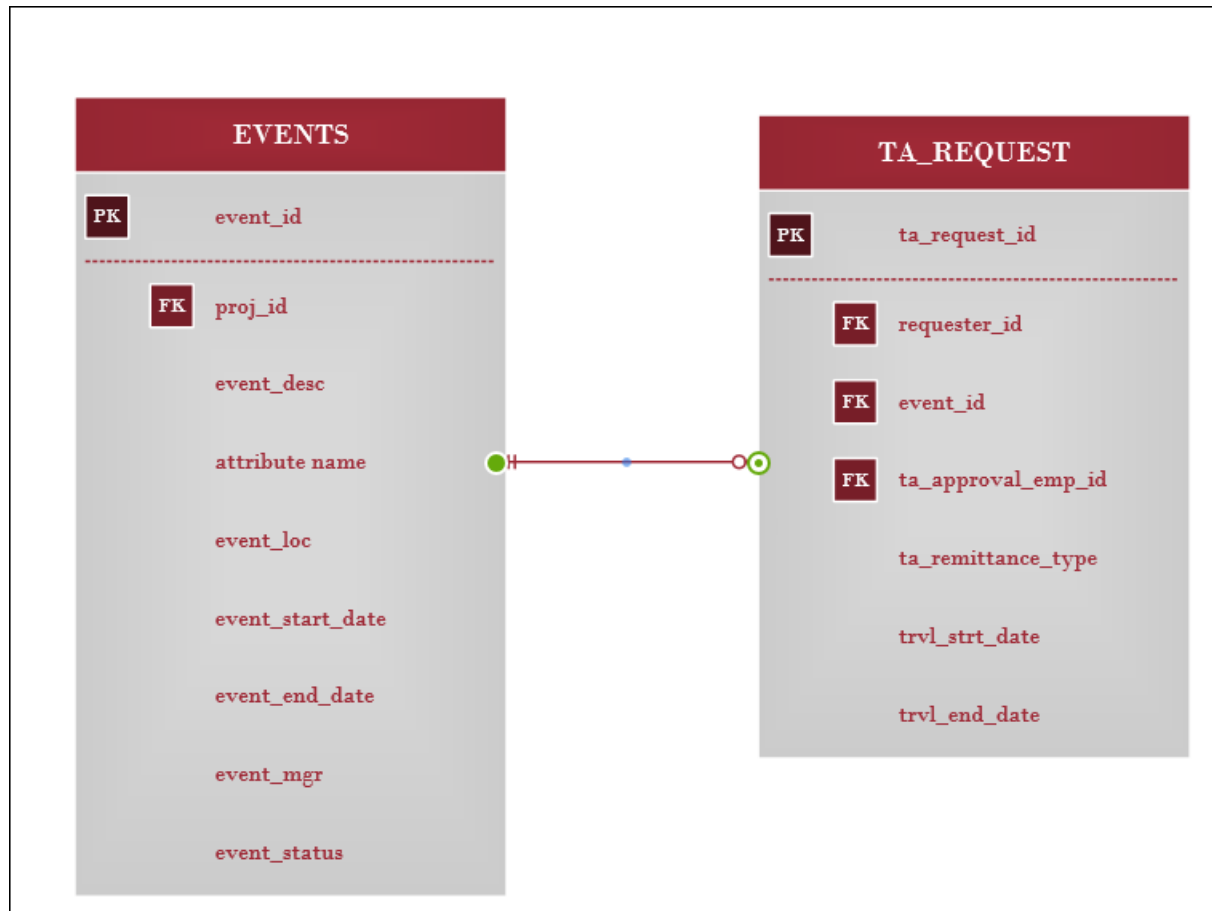
10: EVENTS have EXPENSE_DETAILS:
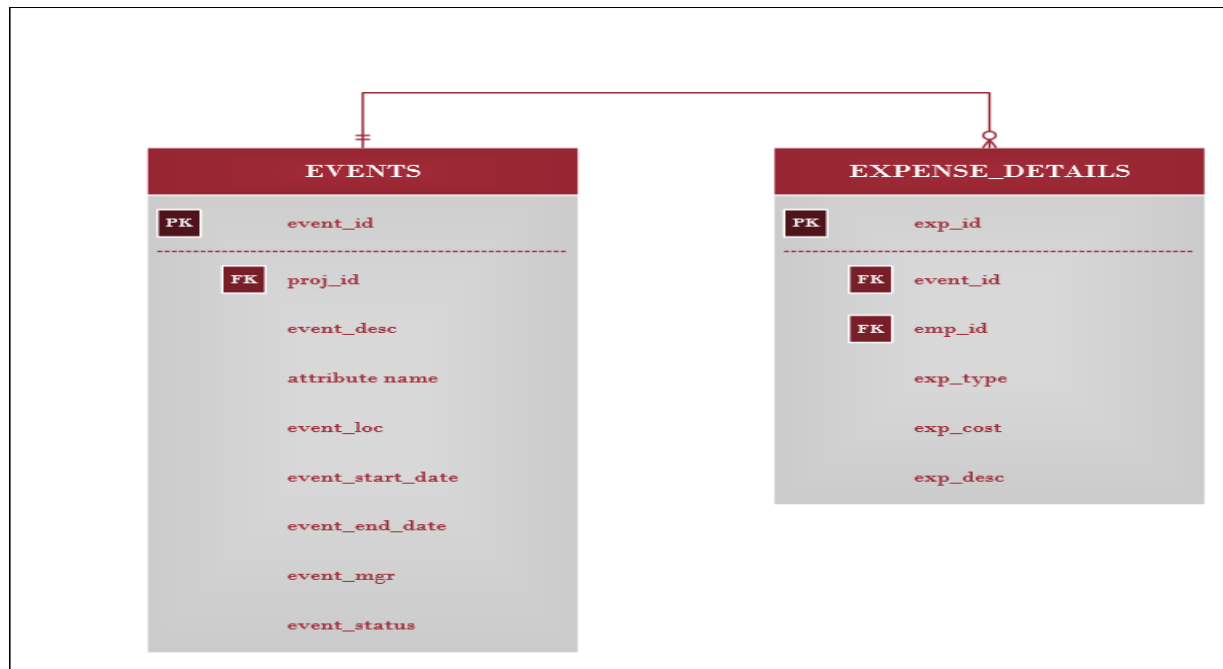
11:Events have TRAVEL_ADVANCES:
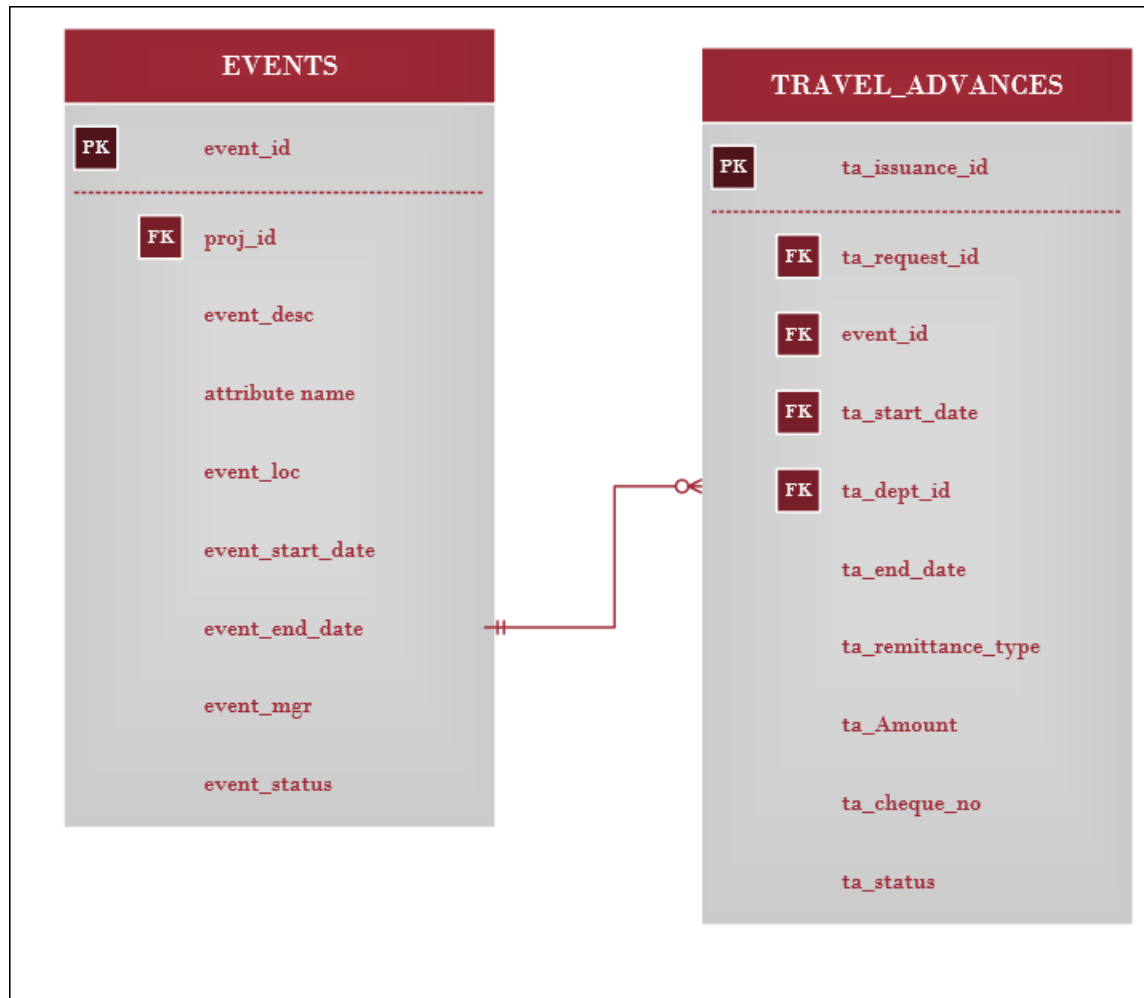
12: RESPONSES are received for a TRAVEL_ADVANCE

13: REQUESTS are raised for issuance of a TRAVEL_ADVANCE
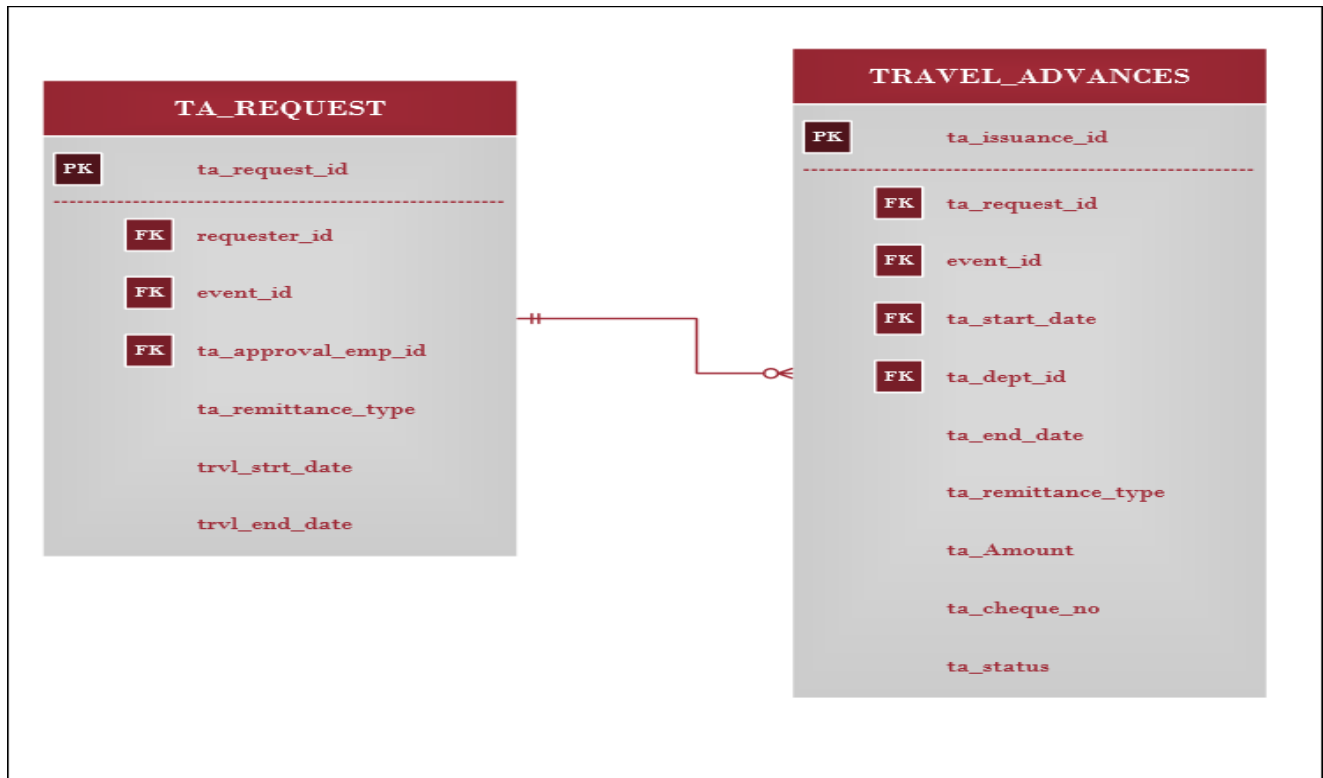
14: REQUESTS are settled in the SETTLEMENT_DETAILS:

TA_REQUEST

PK   ta_request_id

FK   requester_id

FK   event_id

FK   ta_approval_emp_id

ta_remittance_type

trvl_strt_date

trvl_end_date

SETTLEMENT_DETAILS

PK   set_id

FK   set_event_id

FK   set_issuance_id

FK   set_response_id

attribute name

set_utilization_type

set_total_expenses

set_total_advances

set_initiated_date

set_last_modified_date
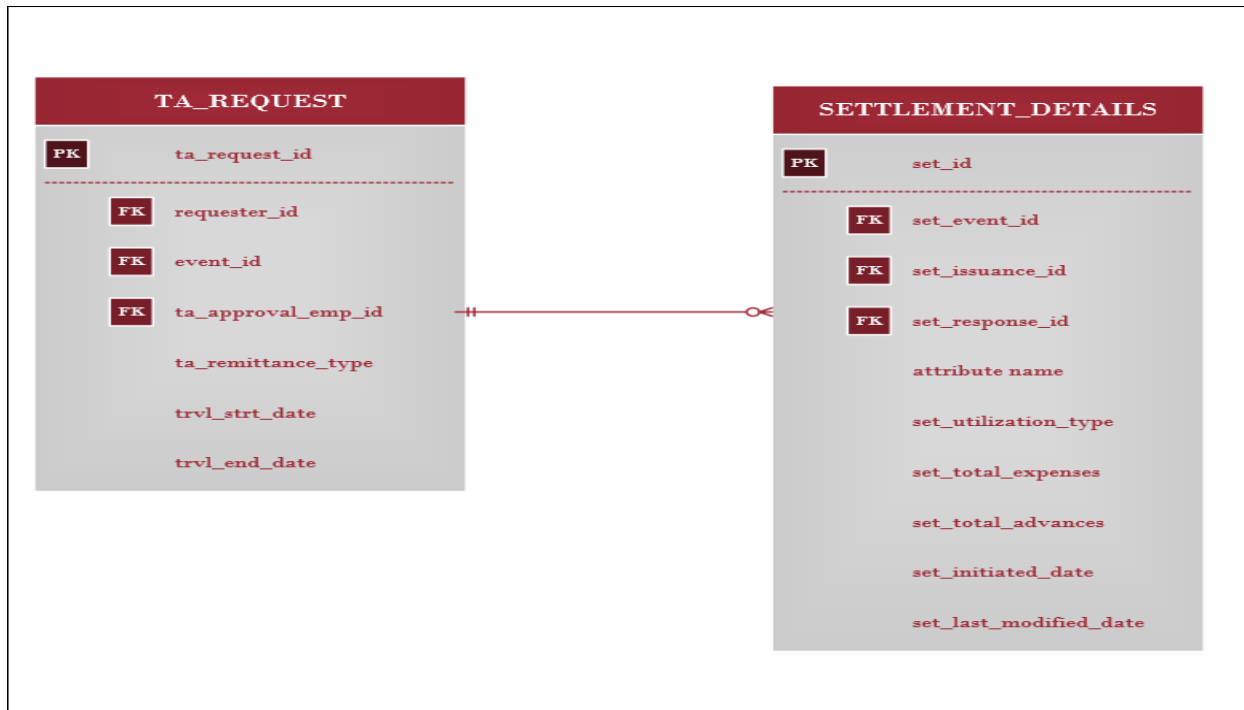
15:PROJECT has EVENTS:

16: TRAVEL_ADVANCE:

TRAVEL_ADVANCES		SETTLEMENT_DETAILS	
PK	ta_issuance_id	PK	set_id
FK	ta_request_id	FK	set_event_id
FK	event_id	FK	set_issuance_id
FK	ta_start_date	FK	set_response_id
FK	ta_dept_id		attribute name
	ta_end_date		set_utilization_type
	ta_remittance_type		set_total_expenses
	ta_Amount		set_total_advances
	ta_cheque_no		set_initiated_date
	ta_status		set_last_modified_date
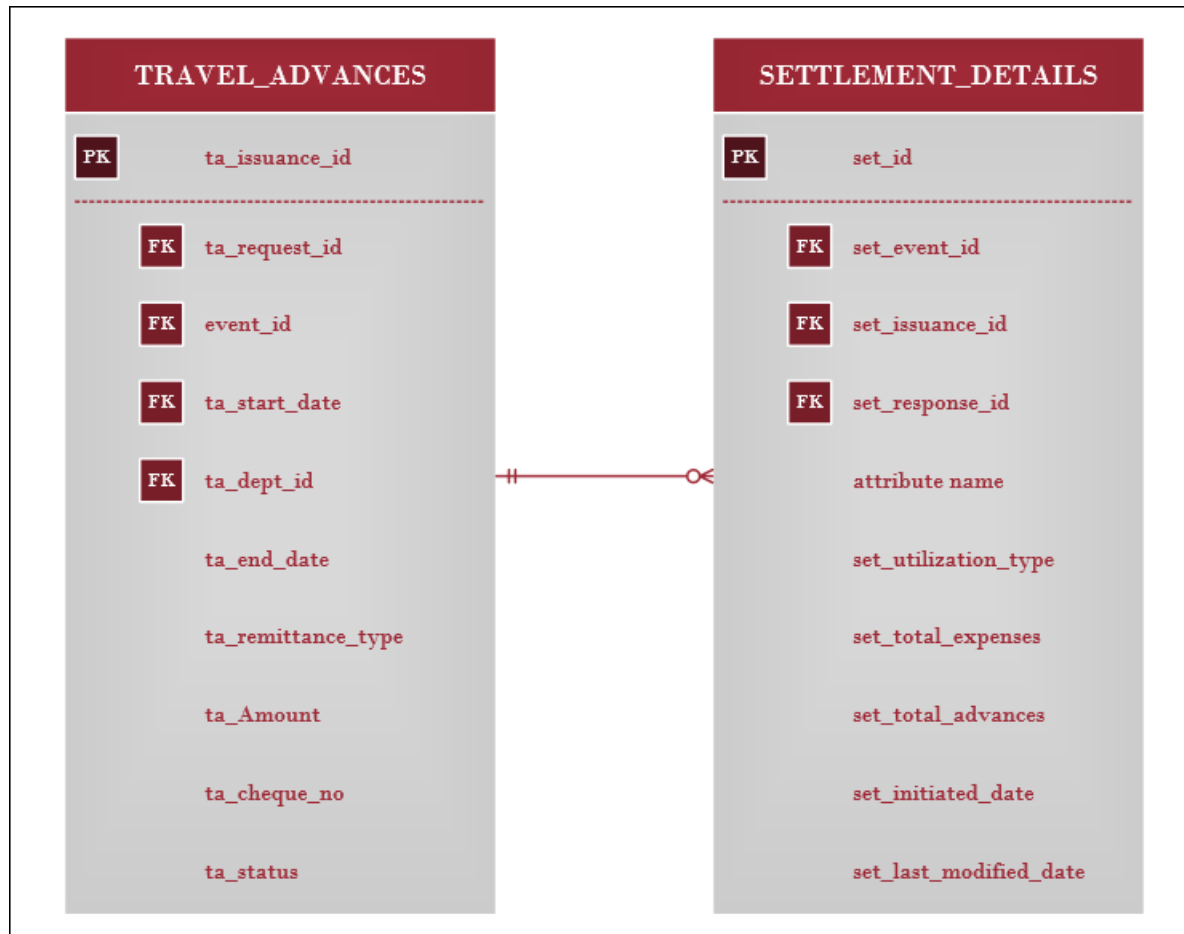
Complete Conceptual Model:

Please refer to the image file/Visio file attached with the submission for image clarity:

DEPARTMENT

FK	dept_id
	dept_name
	attribute name
	dept_loc

EMPLOYEES

FK	emp_id
FK	emp_dept_id
	emp_name
	attribute name
	emp_designation
	emp_phone
	emp_hire_date
	emp_mgr_id

EVENTS

FK	event_id
FK	proj_id
	event_desc
	attribute name
	event_loc
	event_start_date
	event_end_date
	event_mgr
	event_status

PROJECTS

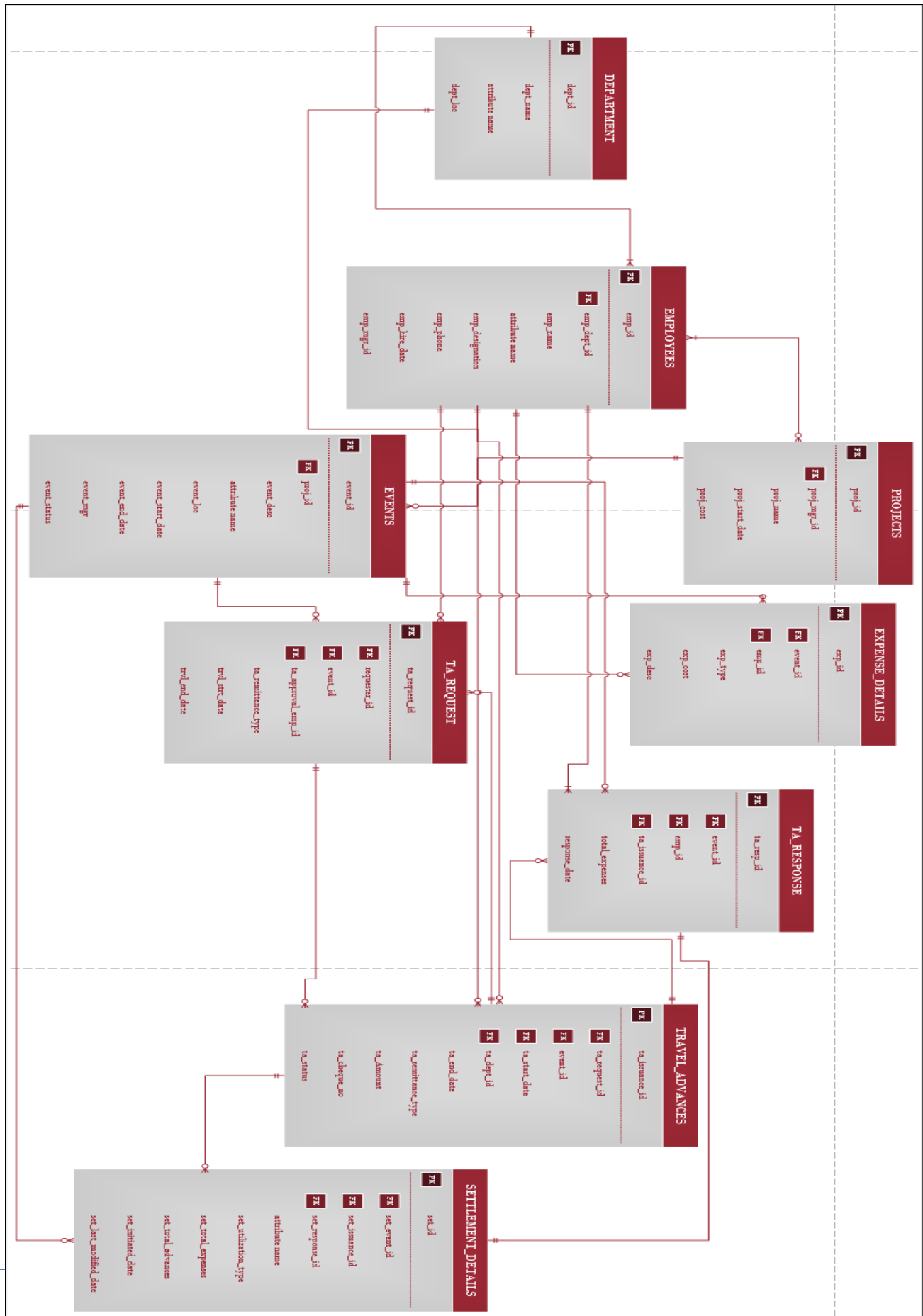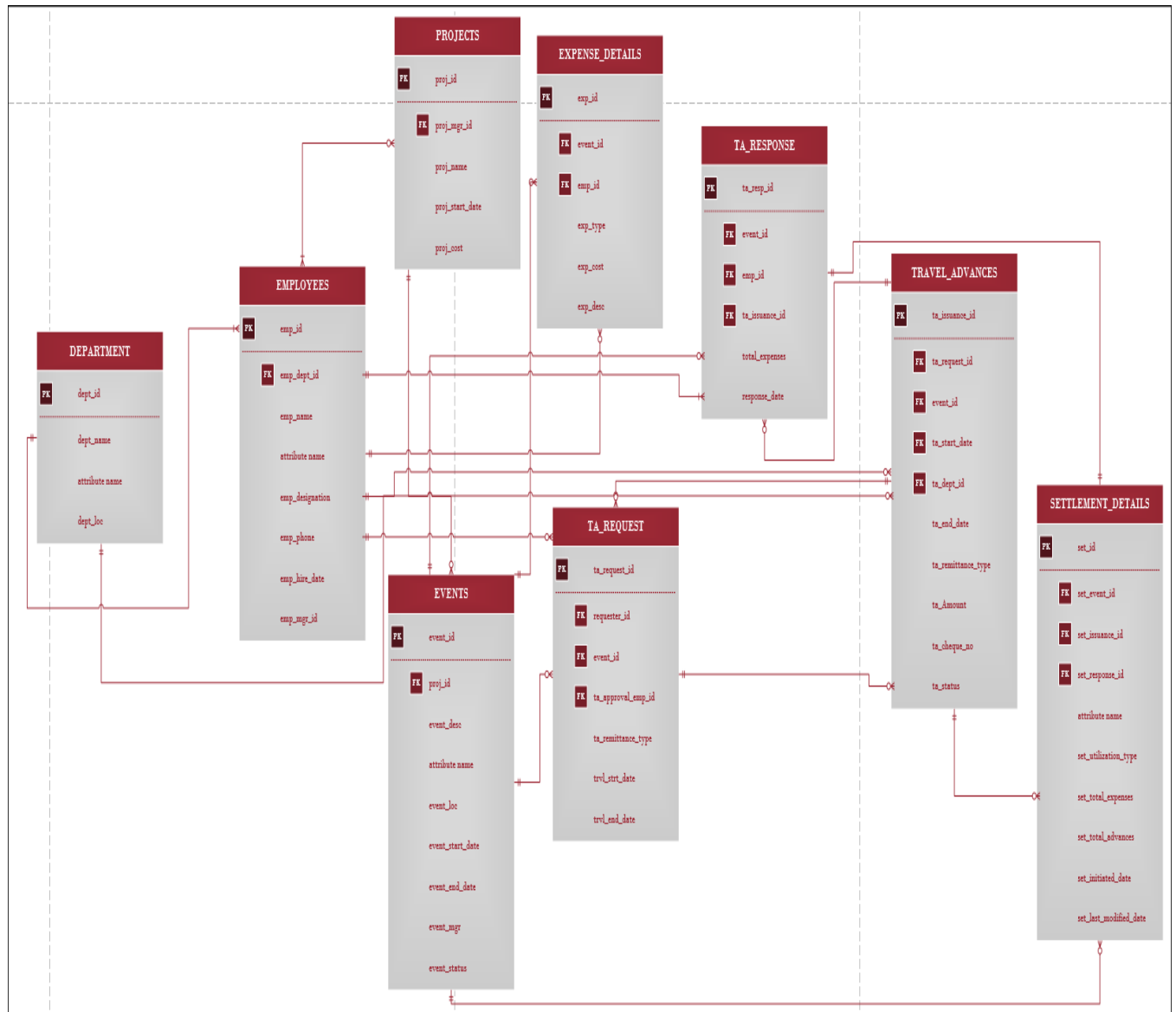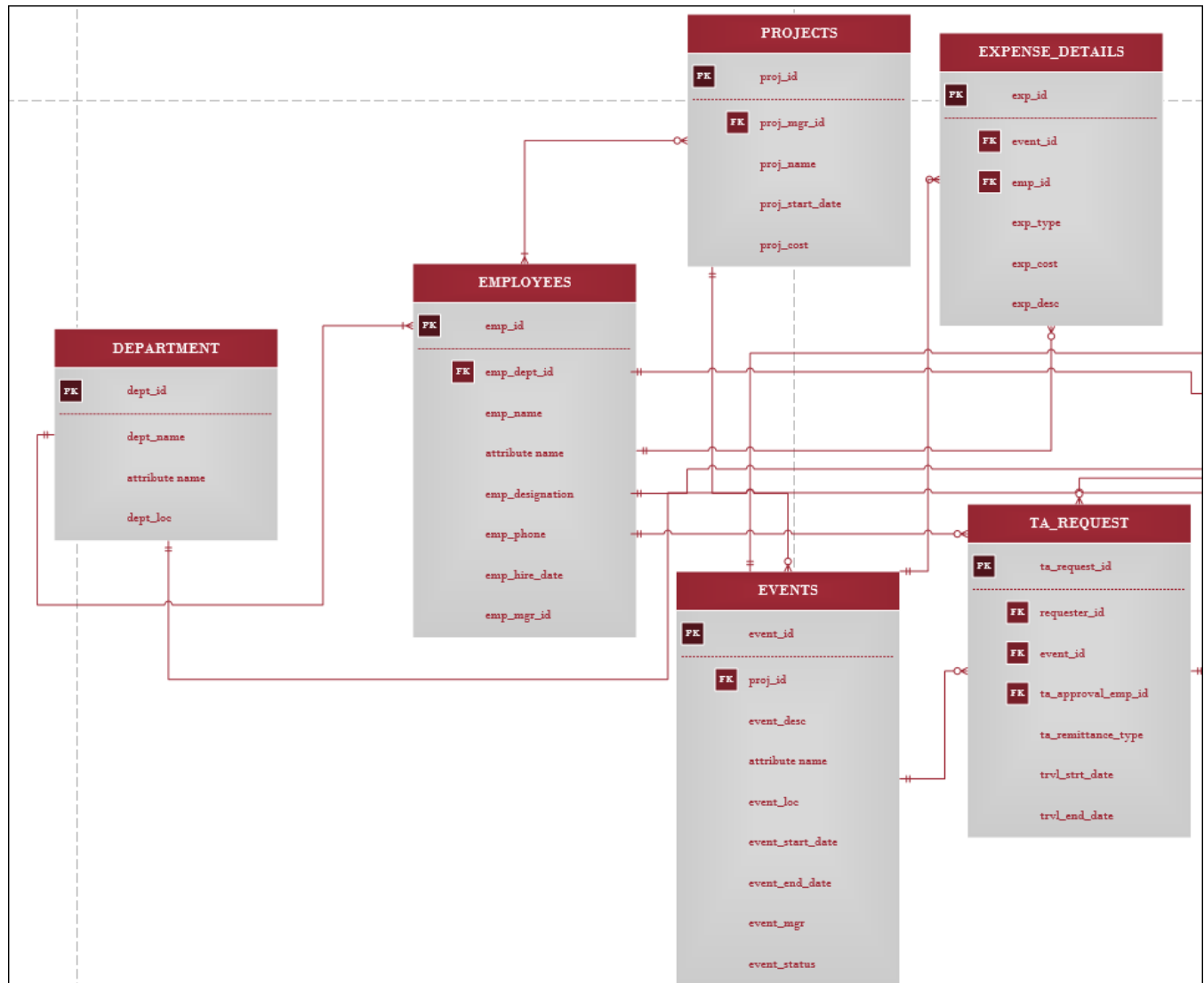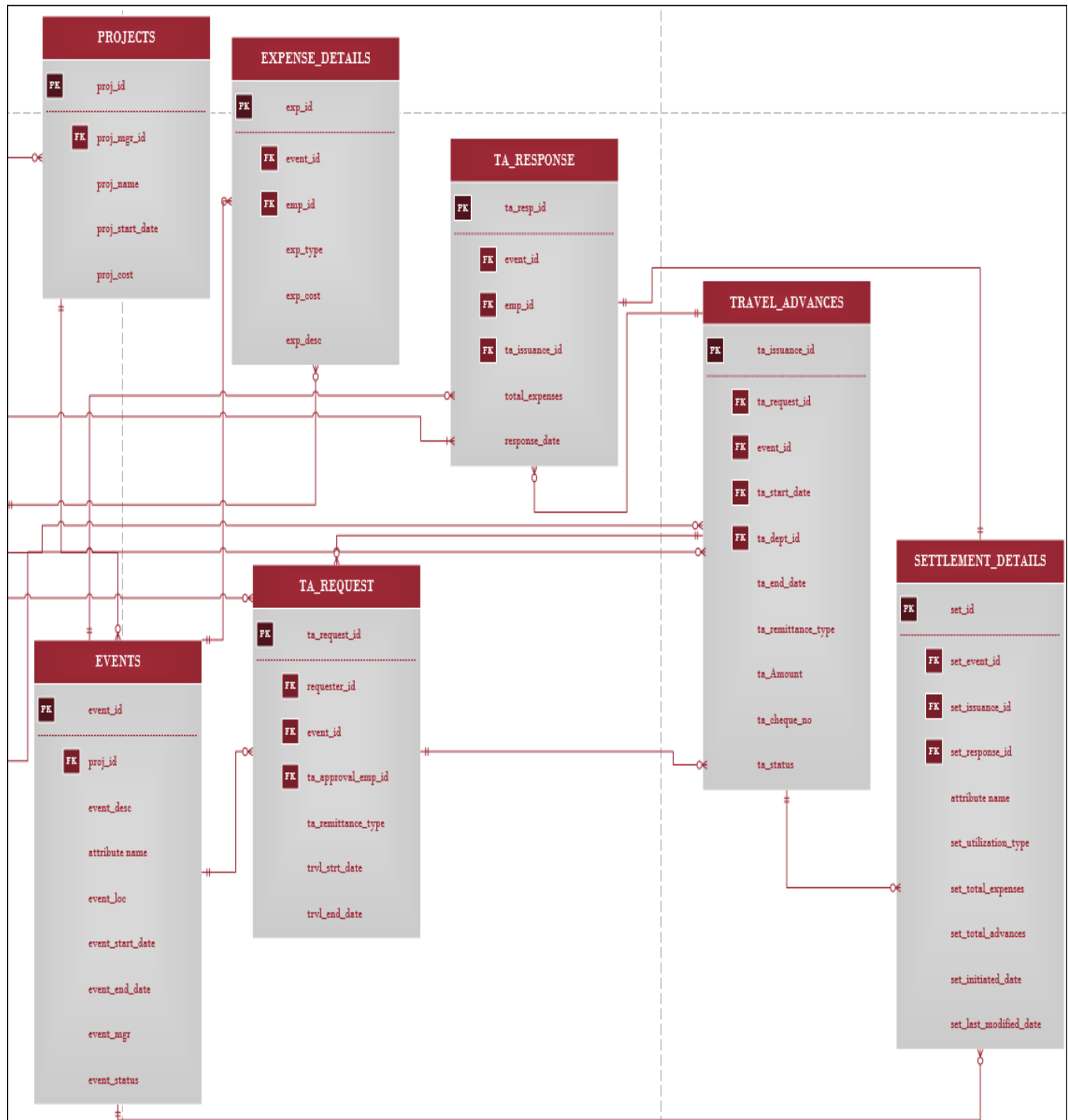|	
FK	proj_id
FK	proj_mgr_id
	proj_name
	proj_start_date
	proj_cost

TA_REQUEST

FK	ta_request_id
FK	requester_id
FK	event_id
FK	ta_approval_emp_id
	ta_remittance_type
	trvl_strt_date
	trvl_end_date

EXPENSE_DETAILS

FK	exp_id
FK	event_id
FK	emp_id
	exp_type
	exp_cost
	exp_desc

TA_RESPONSE

FK	ta_resp_id
FK	event_id
FK	emp_id
FK	ta_issuance_id
	total_expenses
	response_date

TRAVEL_ADVANCES

FK	ta_issuance_id
FK	ta_request_id
FK	event_id
FK	ta_start_date
FK	ta_dept_id
	ta_end_date
	ta_remittance_type
	ta_Amount
	ta_cheque_no
	ta_status

SETTLEMENT_DETAILS

FK	set_id
FK	set_event_id
FK	set_issuance_id
FK	set_response_id
	attribute name
	set_utilization_type
	set_total_expenses
	set_initiated_date
	set_last_modified_date

Conceptual Model, PART 1:

Conceptual Model, Part 2:

Phase 2:

Logical Modelling

Logical Diagram additional details added:
- Cardinality:
- Weak Entities identification:
- Mandatory fields addition:
- Constraints:

Sr No	Entities	Attributes	Description	Keys and Constraints
1.1	EMPLOYEES	Emp_ID	Unique Identifier for each Employee	Primary Key
1.2		Emp_Name	Name of the Employee	Constraint: NOT NULL
1.3		Emp_dept_id	Represents the department to which Employee belongs	Foreign Key to Department.Dept_Id
1.4		Emp_designation	Describes the role of an Employee	NOT NULL
1.5		Emp_phone	Telephone Number of the Employee	
1.6		Emp_Hire_Date	Indicates when the Employee was hired	NOT NULL
1.7		Emp_Mgr_Id	Emp_ID of the Employee who is manager of this Employee, will be same as EMP_ID if	

			the Employee has no Manager	
2.1	DEPARTMENT	Dept_Id	Unique ID for every Department	Primary Key
2.2		Dept_Name	Name of the Employee	NOT NULL
2.3		Dept_Loc	Indicates where the Employee is located	
3.1	PROJECTS	Proj_ID	Unique ID for every Project	Primary Key
3.2		Proj_Name	Name of the Project	NOT NULL
3.3		Proj_Start_Date	Beginning of the Project	
3.4		Proj_End_Date	End of the Project	
3.5		Proj_Mgr_Id	Employee Id of the Project Manager	Foreign Key to the Employees.Emp_Id
3.6		Proj_Cost	Indicates the estimated Project Cost	
4.1	EVENTS	Event_Id	Unique Id for every Event held under a Project	Primary Key
4.2		Proj_Id	Id of the project under which the event is held	Foreign Key to Project.ProjID
4.3		Event_Desc	Describes the details of the Event held	
4.4		Event_loc	Mentions about where the Event is located	
4.		Event_start_date	Begin date of	

5			an Event	
4.6		Event_end_date	End Date of an Event	
4.7		Event_Mgr	Name of the Event Manager	
		Event_Status	Indicates the state of the Event	Open, Closed , Canceled
5.1	EXPENSE_DETAILS	Exp_Id	Unique Id for identifying each expenditure	Primary Key
5.2		Event_Id	Id of the Event for which the expenditure occurred	Foreign Key to the Events. Event_Id
5.3		Proj_Id	Id of the Project Under which the Event is held	Foreign Key to the Projects.Proj_Id
5.4		Emp_ID	Id of the Employee who has submitted the expenses	Foreign key to the Employees.Emp_Id
5.5		Exp_type	Describes the type of expense which is claimed	Can be under below types, a. Lodging b. Meals c. Travelling d. Business Travel Insurance e. Telephone usage f. Event registration fees g. Others
5.6		Exp_cost	Total cost of the expenditure	
5.7		Exp_desc	Mentions the description of the Event	

|				
6.1	TA_REQUEST	TA_Request_Id	Unique Id for every request	Primary Key
6.2		Requester_ID	Employee Id of the employee raising a Travel Advance request	Foreign Key to the Employee.Emp_ID
6.3		Event_Id	Id of the Event for which Travel Advance is being requested	Foreign Key to the Events.Event_Id
6.4		Proj_ID	Id of the Project for which the travel advance is required	Foreign Key to the Projects.Proj_ID
6.5		TA_Remittance_Type	Mentions the method of issuance of the Travel Advance	Can be either CASH or TRAVEL_CARD NOT NULL
6.6		Trvl_strt_date	Start Date of Travel	
6.7		Trvl_end_date	End Date of Travel	
6.8		TA_Apporval_EMP_ID	Emp_ID of the Employee who has approved the Travel Advance Request	Foreign Key to the Employees.Emp_ID
7.1	TRAVEL_ADVANCES	TA_Issuance_Id	Unique ID for identifying each Travel advance issued uniquely	Primary Key

7.2		TA_Request_Id	Link to the request ID which was raised for the Travel Advance	Foreign Key to the TA_Request. TA_Request_Id
7.3		Event_Id	Link to the Event ID for which the Travel Advance is requested	Foreign Key to the Events.Event_Id
7.4		TA_strt_date	Begin Date of the Travel Advance	
7.5		TA_end_date	End Date of the Travel Advance	
7.6		TA_Remittance_Type	Mentions the method of issuance of the Travel Advance	CASH or TRAVEL_CARD
7.7		TA_Amount	Mentions the amount of Travel Advance issued	
7.8		TA_Status	Indicates the type status of the travel advance	Can be in Issued, Canceled, Outstanding or Closed status
7.9		Dept_Id	Links to the Department which is raising the Travel_Advance	Foreign Key to the Department.Dept_ID
8.1	TA_RESPONSE	TA_RESP_ID	Link to the Travel Advance Request ID	Foreign Key to the TA_REQUEST. TA_Request_Id

|				
8.2		Event_Id	Link to the Event ID	Foreign key to the EVENTS.EVENT_ID
8.3		Emp_ID	Employee who has raised the response after an event	Foreign key to the
8.4		Total_Expenses	Total expenditure amount which the Employee has incurred	
8.5		Response_Date	Date when the employee raised a Response	
9.1	SETTLEMENT_DETAILS	Set_ID	Unique ID to identify each settlement	Primary Key
9.2		Set_Event_ID	Event ID for which the settlement is requested	Foreign Key to the EVENTS.EVENT_ID
9.3		Set_issuance_ID	Request associated with the settlement	Foreign key to the TA_REQUEST.REQUEST_ID
9.4		Set_Utilization_Type	Indicates the travel advance utilization type	Indicates the state of the Travel Advance Settlement, can be either Over Utilized Under Utilized Balanced
9.5		Set_total_expenses	Indicates the total expenses reported in the Travel Advance Response	
9.6		Set_total_advances	Indicates the total expenses reported in	

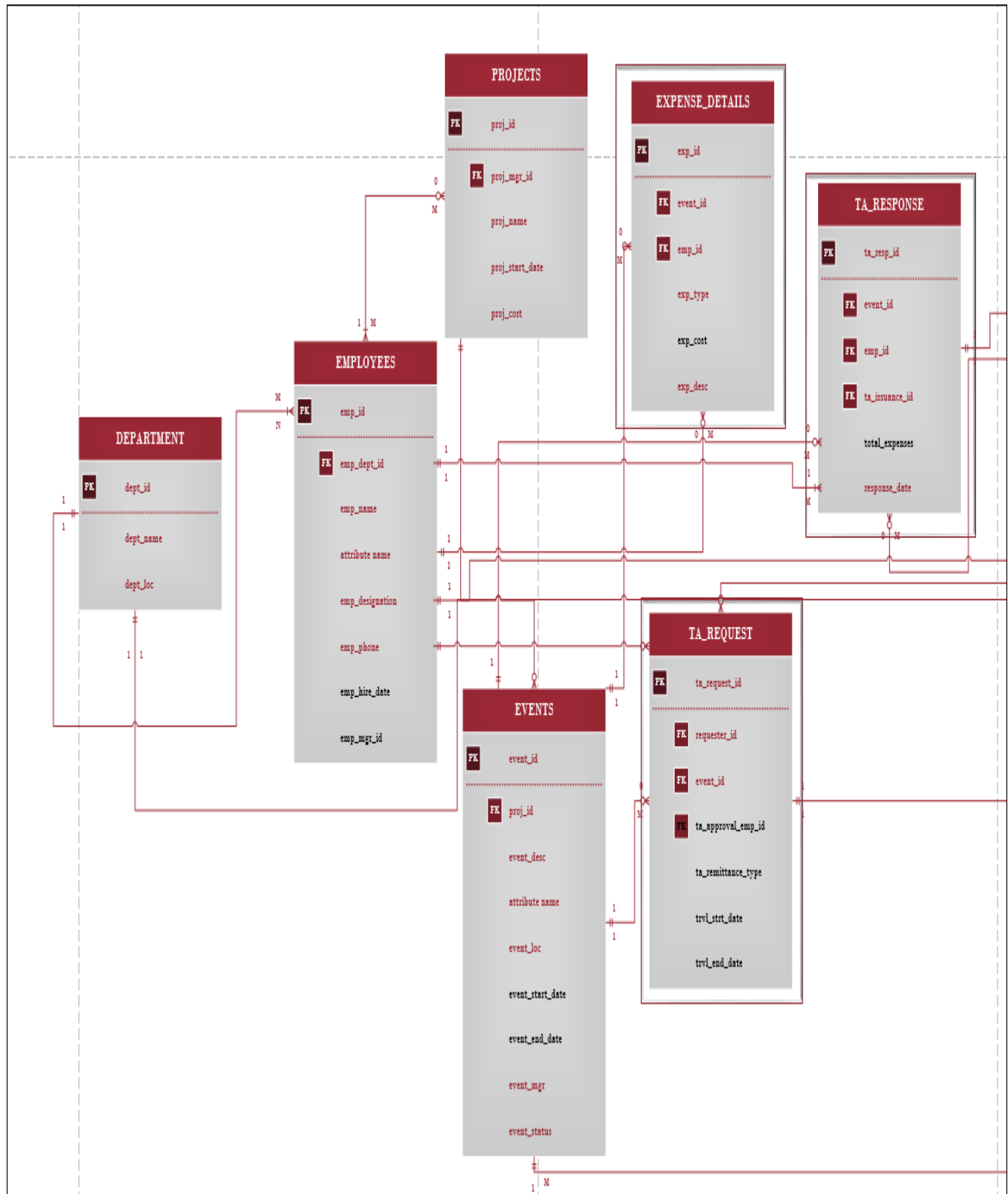|				
			the Travel Advance Request	
9.7		Set_Initiated_Date	Indicates the date when the settlement was first performed	
9.8		Set_last_modified_Date	Indicates the last updated date for the settlement	

Logical Diagram:

Please refer to the image file/Visio file attached with the submission for image clarity:
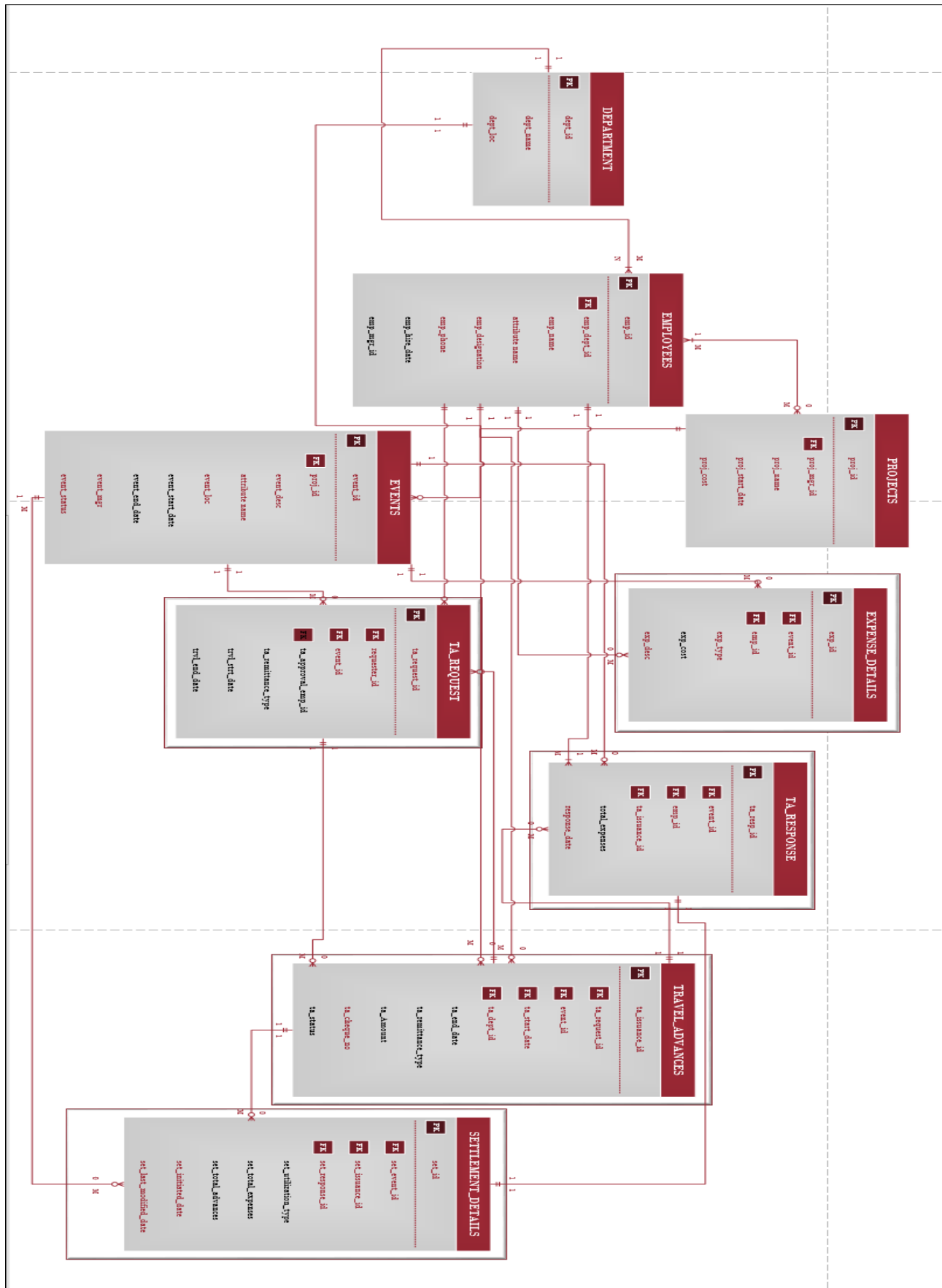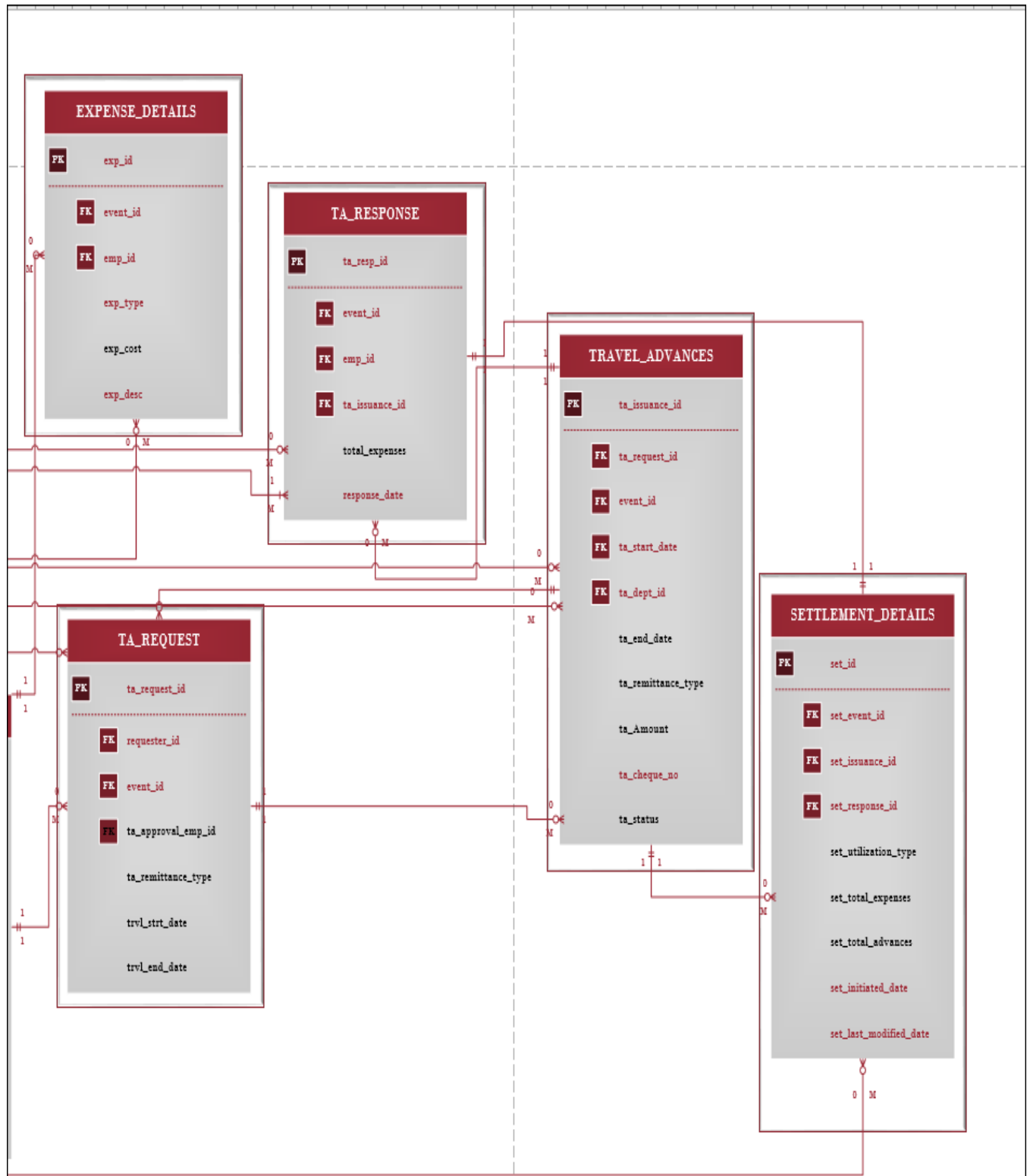
Land Scape View:
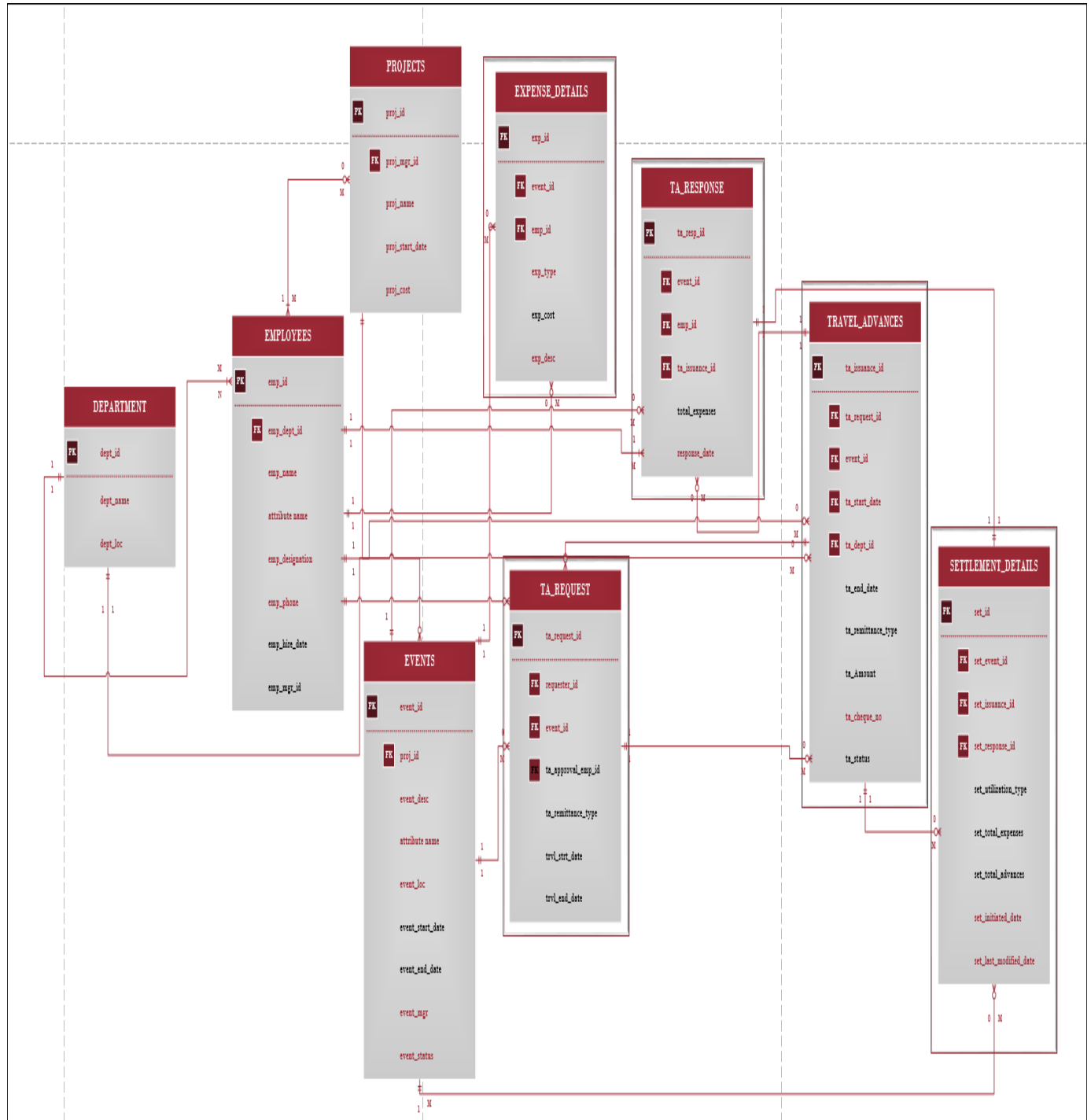
Logical Diagram Part 1:

Logical Diagram, Part 2:

Phase 4:

Since every operation, whether it be request or response or settlement related information will be tracked at the most granular level. Hence, a wide range of analytic operations can be performed on the datasets

Below are some of the useful operations which the organization can run seamlessly for getting insights about the Travel Advance processes at each level

Business Analytics Operations:

1. Top ten and Bottom Ten Employees with maximum number of Travel Advances issued

   Top Ten:
   select * from (
   select TA_REQUEST.Requester_ID,count(1) MAX_MIN from
   Travel_Advances, TA_Request
   where Travel_Advances.TA_Request_Id=TA_REQUEST.TA_Request_Id
   group by TA_REQUEST.Requester_ID,count(1)
) where rownum<=10
   order by max_min desc;

   Bottom Ten:
   select * from (
   select TA_REQUEST.Requester_ID,count(1) MAX_MIN from
   Travel_Advances, TA_Request
   where Travel_Advances.TA_Request_Id=TA_REQUEST.TA_Request_Id
   group by TA_REQUEST.Requester_ID,count(1)
) where rownum<=10
   order by max_min desc

2. Location wise count of Events held in a time span

   Query:
   select Event_loc,COUNT(1) from EVENTS
   where Event_Status<>'CANCELED'
   and Event_start_date >= '01-JAN-2017' and EVENT_END_DATE <='31-MAR-2017'
   GROUP BY Event_loc;

3. Number of canceled Travel Advances per month

   Query:
   select count(1)
   from Travel_Advances where TA_Status='CANCELED'

where TA_strt_date>= '01-JAN-2017' and TA_end_date <='31-JAN-2017';

4. Top 10 Employee with maximum amount of Outstanding pending to be settled

> Query:
> select requester_id,diff as "Outstanding_Amount" from (
> select tr.requester_id,(Set_total_expenses-Set_total_advances) Diff from settlement_Details sd,
> TA_Request tr
> where sd.request_id=tr.request_id
> and sd.set_utilization_type='UNDER_UTILIZED'
> group by tr.requester_id
>) where rownum<=10 and diff>0
> order by diff desc;

5. Top 10 Employees with balanced Outstanding settled before or within time

> Query:
> select requester_id from (
> select tr.requester_id,(Set_total_expenses-Set_total_advances) Diff from settlement_Details sd,
> TA_Request tr
> where sd.request_id=tr.request_id
> group by tr.requester_id
>) where rownum<=10 and diff=0;

6. Employees who have issued maximum number of Travel of Advances Issued in a month
7. Request v/s Approved Travel Advances Comparison for an Employee
8. Project wise maximum and minimum number of Travel Advances Issued trendline
9. Project wise, location wise and Employee designation wise count of Travel Advances issued
10. Trendline line projection indicating the peak and drop of Travel Advances Issuance frequency over a span of time
11. Clustering of projects based on the number of Travel Advances settled
12. Projects with maximum number of Travel Advances requested V/S Approved V/S Settlement status
13. Best performance Employees can be calculated based on a List of Employees who have Settlement Utilization type as "Under Utilized" and has no Canceled Events requested
14. Surge and Drop trendline generation based on various parameters such as Travel Advance requests, Responses, Settlements and Canceled Events
15. Popular Remittance mechanism used based on the number of TA_REMITTANCE_TYPE used for the total number of Travel Advances Issued