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# Properties of Associations between Objects in Object-Oriented Software Package Style

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**ABSTRACT**
One in every of the fashionable paradigms to develop a system is object directed analysis and style. During this paradigm, there are many objects and every object plays some specific roles. When characteristic objects, the assorted relationships among objects should be known. This paper makes a literature review over relationships among objects. Mainly, the relationships are 3 basic varieties, as well as generalization/specialization, aggregation and association. This paper presents 5 taxonomies for properties of the relationships. The primary taxonomy relies on temporal read. The second taxonomy relies on structure and therefore the third one depends on behavioural. The fourth taxonomy is nominative on mathematical read and fifth one associated with the interface. to boot, the properties of the relationships are evaluated in an exceedingly case study and several other recommendations are projected.
***Keywords:-*** Taxonomy, Class, Object, Relationship, Object-Oriented, software package Engineering.

## I. INTRODUCTION

The fashionable paradigm for developing software package is Object-Oriented (OO). During this paradigm, we have a tendency to describe our world mistreatment the article classes (classes) or object varieties (pure abstract category or Java interface) (see [12],[13] and [26]). Every class/object plays a selected role within the software package. These roles are programmed in Object-Oriented languages like C++ and Java. Several attributes (data variables) and services (operations/functions/methods) are assigned to those categories. Then, we have a tendency to model the behaviour of the globe as a sequence of messages that are sent between numerous objects. In OO models, variety of relationships (inheritance, association, and aggregation- see [22],[3] ,[20], [23] and [26]) are known between the classes/objects. Moreover, there are several in style modelling processes and tips like GRASP [28] and ICONIX [27] for assignment responsibility to categories and objects in object-oriented style. In recent years, few researchers target object directed software package engineering. Fakes et al. (2012) describe a way and a tool designed to meet precisely the extract category refactoring [11]. The tactic involves 3 steps: (a) recognition of extract category opportunities, (b) ranking of the opportunities in terms of improvement to anticipate which of them to be thought of to the system style, and (c) absolutely machine-driven application of the refactoring chosen by the developer. Biota et al. (2014) propose associate degree approach for automating the extract category refactoring [1]. This approach analyses structural and linguistics relationships between the ways in every category to spot chains of powerfully connected ways. The known technique chains are wont to outline new categories with higher cohesion than the initial category, whereas conserving the coupling between the new categories and therefore the categories interacting with the initial category. The primary step for building associate degree OO model is to search out the objects. During this step, we have a tendency to aren't extremely finding objects. In fact, we have a tendency to be literally finding classes and kinds (analysis concepts) that may be enforced mistreatment categories and pure abstract categories. The results of drawback analysis may be a model that: (a) organizes the info into objects and categories, and offers the info a structure via relationships of inheritance, aggregation, and association; (b) specifies native purposeful behaviours and defines their external interfaces; (c) captures management or international behaviour; and (d) captures constraints (limits and rules). Within the world, no object couldn't be freelance of all different objects, like associate degree island. Objects generally rely on different objects for services and probably for error handling, constant information, and exception handling. Relationships capture the interdependencies between objects and supply the means that by that objects fathom one another. In object orientation, each service request (function call) should be sent to a selected object whereas within the procedural languages a perform may be referred to as

directly. For example, so as for object A to send a message to object B, object a requirement have a handle to object B (in C++, a reference or pointer). Accessing another object's services may be performed within the following ways(See [7] , [9] , [10] , [11] , [14] and [29]): The job object, that features a handle, passes the handle of the opposite object together of the arguments of the perform (message) signature. The referred to as object features a relationship (aggregation or link) to the opposite object. The required service belong to associate degree 'ancestor' category. Ascendant means that a super-class. The access of static category perform, which can be thought of a managed international perform. The most motivation of this paper is to survey the relationships among objects and makes 5 taxonomies for his or her properties. The structure of remaining sections is as follows. In Section a pair of, the literature review and main relationships among objects are delineated. In Section three, the taxonomies are nominative. In Section four, sensible expertise and guidelines are bestowed. Finally, Section five is taken into account to outline and future works.

## II. LITERATURE REVIEW

In the literature ([2], [3], [4], [5], [6], [8], [16], [26], [23] and [20]), we have a tendency to found 3 basic relationships among classes/objects: generalization/specialization (inheritance), aggregation and association. These are by no means new ideas and most professionals work with them a day in modelling.

GENERALIZATION/SPECIALIZATION:

We all learned generalization/specialization once learning taxonomies in biology category. This can be a relationship between categories instead of objects. Generalization/Speciation 'Is a Type' relationship between categories. As an example, take into account 2 objects: 'Person' and 'Student'. Student 'is-a' Person. Thus, the attributes of an individual is additionally attributes of student. During this relationship, attributes, relationships, services, and ways are familial from the generalization (super-class) by the specialization (subclass).

AGGREGATION:

This may be a relationship within which one object is created from different objects; e. g. Automotive and engine. Aggregation captures the whole-parts relationship between objects. In distinction to generalization/specialization, there's no inheritance between objects taking part in associate degree aggregation. The most benefits of aggregations are that they scale back complexness by permitting software package engineers to treat several objects together object. Association: this can be a relationship by that associate degree object is aware of concerning another one. a superb example of associate degree association (link) is wedding. Moreover, links within the kind of associations are wide used for years in the info modelling community. These relationships and their identifications are delineated within the following subsections.

### 2. 1 GENERALIZATION/SPECIALIZATION

To characteristic generalization/specialization relationship, software package engineers should perform the 'IS_A' test between pairs of objects when characteristic objects. In fact, software package engineers raise the questions: (a) Is Object An associate degree Object B? ; (b) Is Object B associate degree Object A? Note that we have a tendency to be extremely asking if associate degree object of A is associate degree object of group B. Allowed answers of these queries are: (a) 'always'; (b) 'sometimes' and (c) 'never'. Supported the answers, software package engineers create some interpretations in keeping with the data given in Table-1. a lot of details on the matter together with some examples are given in [16].

| | Questions | | Interpretation |
|---|---|---|---|
| | Is B an A? | Is Aa B? | |
| Answer | Always | Always | Synonymous |
| | Sometimes | Always | B is a generalization of A |
| | Always | Sometimes | A is a generalization of B |

Table-1: The interpretation of the results in IS_A Test

### 2. 2 AGGREGATION

Sadly, most software package engineers have difficulties applying this relationship properly in observe as a result of the object-oriented paradigm has not outlined the aggregation mechanism o. k. . . the newest literature on this subject argues that this can be

because of the very fact that aggregation, itself, is associate degree 'ancestor' construct. It's our belief that software package engineers ought to use the 'descendent' ideas (more specialization) to be able to use this mechanism effectively. These descendent ideas, or totally different forms of aggregation, can capture extra properties that may facilitate software package engineers to manage complexness effectively. From a theoretical perspective, linguists, logicians, and psychologists have studied the character of relationships. One in every of relationships that has been studied affordable well is that the relationship between the components of things and therefore the wholes that they create up. In an exceedingly joint paper, Morton wins ton, Roger Chaffin, and Douglas Herrmann mentioned this whole-parts relationship [25]. They delineated many forms of aggregation. The paper known six varieties of aggregation; Lee associate degreed Tepfenhart (2005) else a seventh [16]; we have a tendency to else an eighth:(a)Assembly-Parts;(b) Component-Integral Composition;(c) Material-object Composition;(d) Portion-Object Composition;(e) Place-Area Composition;(f) Collection-Members composition;(g) Container-Content(Member-Bunch Composition);(h) Member-partnership composition and (i) Compound-Elements Composition. Assembly-Parts (Component-Integral) Composition: during this aggregation, the entire is comprised of the parts that maintain their identity even after they are a part of the entire. The components have a selected purposeful or structural role with relevance one another. To spot this aggregation, software package engineers should hunt for some keywords like 'is half of' and 'is assembled from'. As an example, a keyboard is a component of a laptop and chairs are components of the workplace. Note that during this relationship the assembly doesn't exist while not components and therefore the parts might not be haphazardly (incidentally) organized, however should be are a selected relationship, either structurally or functionally. Moreover, the entire exhibits a checker structure or organization.

In observe, the entire might be:

(a)Tangible like automotive, toothbrush and printer;

(b) Abstract like physics, arithmetic and jokes;

(c) Structure like world organization and United Nation;

(d) Temporal like performance and film showing.

Material-Object Composition: during this sort of aggregation, the components lose their identity after they are wont to create the entire. This defines associate degree invariant configuration of components at intervals the entire as a result of no half is also fare away from the entire. To spot this relationship, software package engineers should hunt for key words like 'is partly' and 'is created from'. As an example, suppose bread is formed from flour, a table is formed from wood and an automotive is formed of materials like iron, plastic and glass.

Portion-Object Composition:

This aggregation defines the same configuration of components within the whole. Usually, parts of the objects may be divided mistreatment standards measures like inches, litres, hours and then on. The portion-object composition supports the arithmetic operations +, -, ×, /. To spot this sort of relationship, software package engineers should hunt for some keywords like 'portion of', 'slice', 'helping of', 'segment of', 'lump of', and such similar phrases. As an example, a second is a component of every day and a meter is a component of kilometre.

Place-Area Composition:

This aggregation defines the same and invariant configuration of components in an exceedingly whole. It's unremarkably wont to establish links between places and explicit locations at intervals them. Once searching for this aggregation, hunt for preliminary Portion-object composition then raise if this relationship is invariant. As an examples, Colchester is a component of UK and a space is a component of an edifice.

Collection-Members Composition:

This aggregation may be a specialised version of the Place-Area Composition. Additionally to being homogeneous and invariant configuration of components at intervals and entire, there's associate degree understood order to its members. Once searching for this aggregation, hunt for place-area aggregation then check if there's associate degree understood order. As an example, suppose Collection-members Composition Airline reservation with its numerous flight segments and Monthly timesheet-daily timesheets.

Container-Content (Member-Bunch) Composition:

This aggregation defines a group of components as an entire. The sole constraint, here, is that there's a spatial, temporal or social association for deciding once a member is a component of the gathering. This aggregation tends to be an enclosure (contents while not classification) for aggregation-type relationships. For example, suppose a box with contents of the box and a bag with its contents of bag.

Member-Partnership Composition:

In this aggregation, the components bearer neither a purposeful nor a structural relationship to every different or to the entire. The contents are neither homogeneous nor invariant. As an example, we will take into account associate degree Union and members and an organization and its staff. This can be associate degree invariant kind of the container-content aggregation. Members during this relationship cannot be removed while not destroying the aggregation.

Compound-Elements Composition:

During this aggregation, the components bearer neither a purposeful nor a structural relationship to every different or to the entire. The contents are homogeneous and variant. The parts are haphazardly (incidentally) organized within the whole. As an example, we will take into account a celebration and folks in an exceedingly society. Note that associate degree object may be viewed as over one aggregation. As an example, we will take into account Bread as combination of slices (Portion-Object) and Bread as fabricated from flour, egg (Material-Object).

**2. 3 ASSOCIATION**

Associate degree association may be a relationship that enables associate degree object to grasp concerning another one. This relationship is taken into account to be bi-directional as link through that one object traverses in either direction. Associate degree association will have attributes and services. The simplest supply for initial identification and specifying associations and aggregations is that the needs documents. Links, like services are typically seen as verbs. As an example, 'which it gets from', 'keep track of', 'changes with', and 'depends upon'. The sequence diagrams and behaviour specification documents additionally facilitate to search out the links. Once software package engineers are identifying between association and aggregation, many points should be considered: (a) associate degree aggregation might not connect associate degree object to itself (e. g., supervise is between 2 instances); (b) Multiple connections between objects are potential (e. g. Worker doing many tasks). (c) Self associations are potential and customary (e. g. Relative association on Student) and (d) Multiple association doesn't imply that an equivalent 2 objects are connected double.

## III. TAXONOMIES

One the main gaps and analysis desires is to possess an outline and taxonomy on properties of relationships among classes/objects in Object-Oriented software package development. In keeping with Merriam-Webster [18], taxonomy is that the study of the final principles of scientific classification, and is particularly the orderly classification of things in keeping with their probable natural relationships. The main variations between properties of relationships among objects, in general, rely on the temporal, structure, behavioural and interface views, and specifically mathematical read. There are, therefore, 5 taxonomies to reason properties of the relationships among objects in Object-Oriented development. These taxonomies are delineated within the following sub-sections.

**3. 1 THE INITIAL TAXONOMY: PROPERTIES ON TEMPORAL**

The primary taxonomy for properties of the relationships among objects is bothered with varied aggregation dependency over time. Therefore, there are 2 properties of the connection during this taxonomy: Static: during this property, parts in an exceedingly whole are fastened and can't be modified over time. Within the aggregations per Section 2-2, Assembly-Parts (Component-integral) Composition, Material-object Composition and Portion-object Composition are during this taxonomy. as an example, a phone is assembled from its components and Windows are components of a house. Dynamic: during this property, parts in an exceedingly whole might vary over time. Within the aggregations known in Section 2-2, Material-Object Composition, Place-area composition, Collection-members composition, Container-content (Member-Bunch) composition and Member-Partnership composition are dynamic.

**3. 2 THE SECOND TAXONOMY: PROPERTIES ON STRUCTURE**

The second taxonomy relies on the question of whether or not or not the relationships bearer a selected purposeful or structure among classes/objects. Within the generalization/specialization relationship, this taxonomy associated with the subsequent properties: Attributes: The descendent can have all of the attributes of the ascendant. As an example, suppose the worker category that inherits from the Person category in an exceedingly general payment system; the worker has the age attribute as a result of it's a descendant category of Person. Links: The descendant can have all of the non-generalization links of the ascendant. As an example, if we have a tendency to add a wedding link between 2 persons, 'Student'will have a wedding link as a result of it's a descendent of 'Person'. Within the aggregation relationship, we will reason the properties of the

relationships according to the mixture of the subsequent facets: Configuration: during this aspect, we have a tendency to should confirm whether or not or not the components beare a selected purposeful or structure relationship.

Homogenous:

In this facet, we have a tendency to confirm whether or not or not the components are from an equivalent quite factor within the whole.

Invariance:

In this facet, the sort of the connection is set by the fundamental properties of whether or not or not the components may be separated from the entire. Table-2 shows the categories of aggregation known in Section 2-2, in keeping with the properties on the structure read.

Table-2: totally different combination of properties within the Aggregation relationship.

| Type of Aggregation | Configuration | | Homogenous | | Invariance | | Example |
|---|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No | |
| Assembly-Parts (Component-Integral) Composition | √ | | | √ | | √ | Windows are parts of a house |
| Material-Object Composition | √ | | | √ | √ | | A care is made of materials such as iron, plastic and glass |
| Portion-Object Composition | √ | | √ | | | √ | A second is part of a day |
| Place-Area Composition | √ | | √ | | √ | | A room is part of a hotel |
| Collection-Members Composition | | √ | | √ | √ | | Monthly timesheet and daily timesheets |
| Container-Content (Member-Bunch) Composition | | √ | | √ | | √ | A box and contents of the box |
| Member-Partnership | | √ | √ | | √ | | Union and members |
| Compound-Elements Composition | | √ | √ | | | √ | A party and several people |

### 3. 3 THE THIRD TAXONOMY: PROPERTIES ON BEHAVIOR

The third taxonomy for properties of the relationships is supported however the behaviour of classes/objects betting on others. In Generalization/ Specialization relationship, we've got 2 varieties of properties: Generalization while not polymorphism (Good child): All ways equipped by the ascendant for services also are employed by the descendent to produce the corresponding services. Generalization with polymorphism (Bad child): Some ways provided by the ascendant for its services are employed by the descendant. However, the descendant will provide its own made-to-order ways that replace the suitable ways.

### 3. 4 THE FOURTH TAXONOMY: PROPERTIES ON MATHEMATICAL

The fourth taxonomy for properties of relationships relies on mathematical read. Within the generalization/specialization relationship, we've got 2 following properties between categories: Anti-symmetric: If class A may be a descendant of sophistication B, then category B cannot be a descendant of sophistication A. E. g. 'Employee' may be a person, however not all persons are staff. Transitivity: If category C may be a descendant of sophistication B and sophistication B may be a descendant of sophistication A, then category C may be a descendant of sophistication A. e. g. If we have a tendency to add the very fact that a 'Salesperson' may be a 'Employee' then 'Sales Person' is additionally a 'Person'. Moreover, it additionally has the age attribute. Within the aggregation relationship, we've got 2 following properties of the connection between objects: Anti-symmetry: If associate degree object A may be a a part of associate degree object B, then the article B cannot be a region of the article A. Transitivity: If associate degree object C {is part |is a component is associate degree element} of associate degree object B and therefore the object B is a component of an object A,

then C is a component of A. Note that the transitivity holds just for aggregations of an equivalent kind. as an example, we will consider: (a) Microwave is a component of a room (Component-integral) and (b) room is a component of a house (Place-area), however Microwave isn't a part of a house.

**3. 5 THE FIFTH TAXONOMY: PROPERTIES ON INTERFACE**

The fifth taxonomy for properties the relationships is associated with providing service by associate degree object for others. With this read, within the generalization/ specialization relationship the descendant should additionally give all services provided by the ascendant. as an example in an exceedingly Personnel Management System, if the 'Person' object had a 'Get_Degree' service, then 'Student' will have a 'Get Degree' service as a result of 'Student' may be a descendent of 'Person'. Within the association relationship, a link may be binary (between 2 objects), ternary (among three objects), or higher. In observe, it's rare to search out links with a linguistics which means that tie together objects of 3 totally different object varieties (classes)[16]. An honest example for binary association would be a link between 'Student' and 'Course'. By extending this relationship, we will have a ternary relationship among the 'Student', 'Software', and 'Course' objects. It captures the very fact that students use numerous software package tools for various courses.

## IV. PRACTICAL EXPERTISE AND TIPS

So as to gauge the relationships and their properties in observe, we have a tendency to use a bearing Command Police System (CCPS) that a mini-requirement is concisely delineated in[23]. We swollen this technique and utilized in our study due to its fertility for reusability in each application and system software package. This police service system should respond as quickly as potential to rumoured incidents and its objectives are to make sure that incidents are logged and routed to the foremost acceptable police vehicle. The foremost necessary factors that has to be thought of that vehicle to decide on to an occasion include: sort of incident: some necessary and worsening events want immediate response. It's suggested that nominative classes of response actions are assigned to a precise sort of incident. Location of obtainable vehicles: usually, the simplest strategy is to send the nearest vehicle to handle the incident. Confine mind that it's unfeasible to grasp the precise position of the vehicles and will ought to send a message to the automotive to work out its current location. Sort of obtainable vehicles: some incident want vehicles want and a few special incident like traffic accidents might have auto and vehicles with specific instrumentality. Location of incident: In some areas, causing only 1 vehicle for response is enough. In different areas, is also a police vehicle to reply to an equivalent sort of accident is enough. Different emergency services like fireman and ambulance: the system should mechanically alert the wants to those services. Reportage details: The system ought to record details of every incident and create them obtainable for any data needed. The utilization Case Diagram and Activity Diagram of this technique are delineate in Fig. 1, and Fig. 2, severally. We have a tendency to enforced this technique in Microsoft Foundation categories (MFC) as application framework for MS Windows (see[17], [19], [21], [27] and [28] for tips of implementations). The category Diagram of this technique is delineate in Fig. 3. During this category diagram, there are several categories. the most categories, here, are 'Incident', 'Police Staff', 'Police Vehicle', 'Police Officer', 'Director', 'Route Manager', 'Incident Waiting List', 'Response' and 'GPS Receiver'.

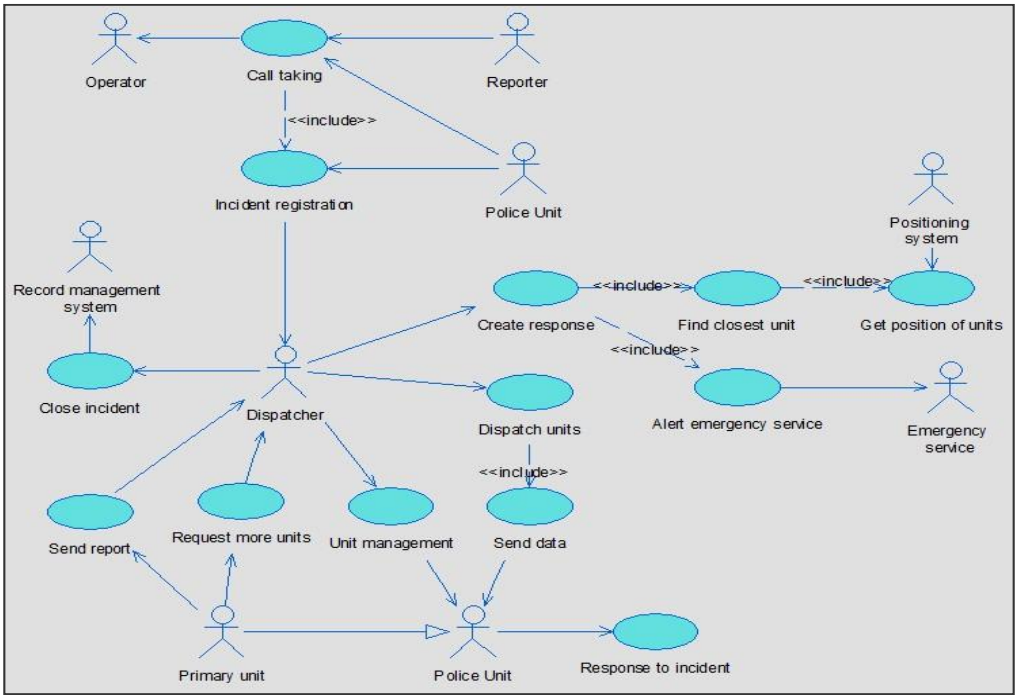


Fig. 1: the utilization Case Diagram of the management Command Police System

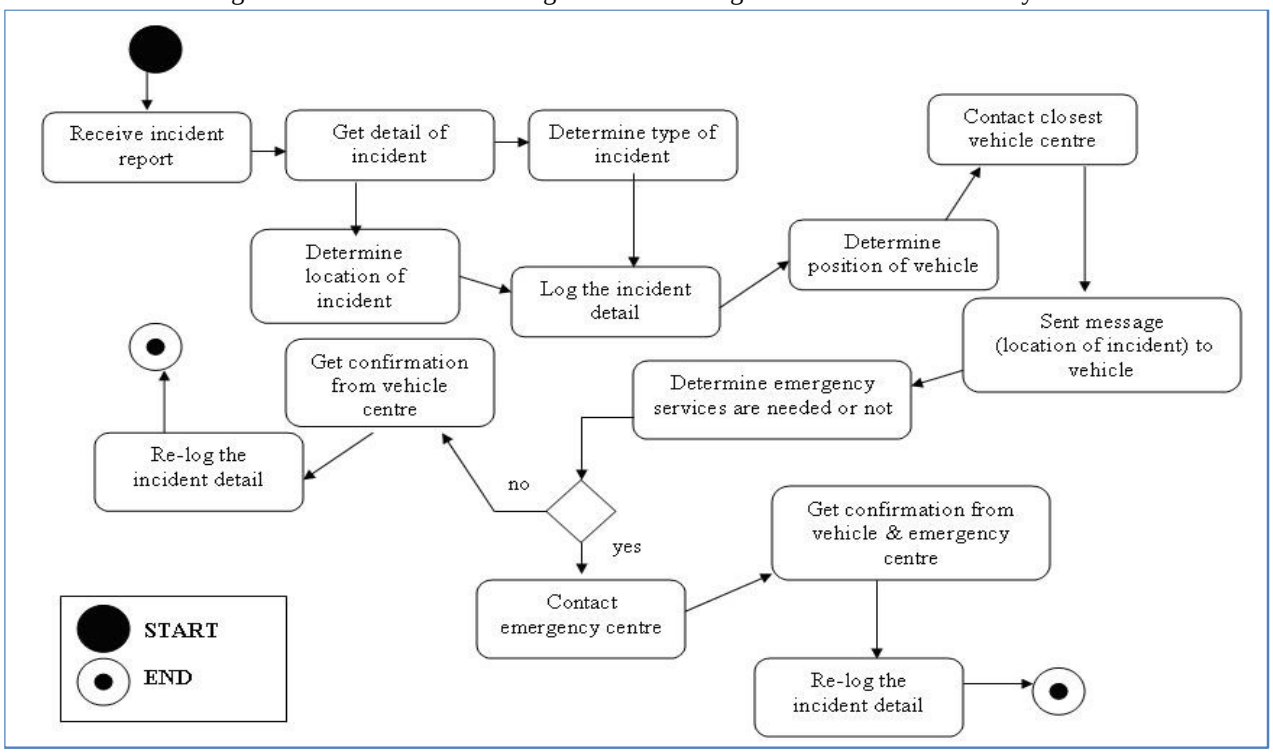


Fig. 2: The Activity Diagram of the management Command Police System

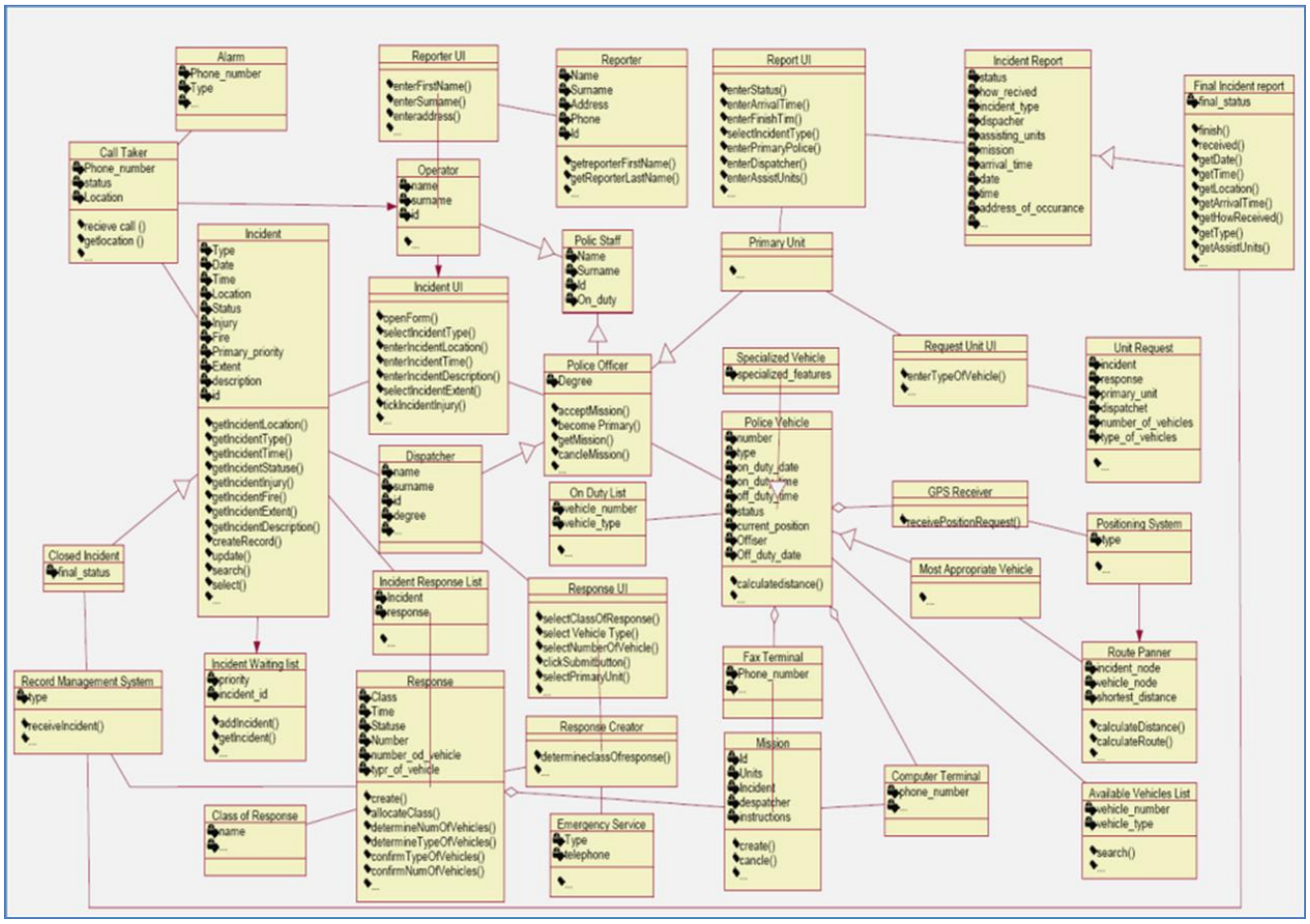


Fig. 3. The Class Diagram of the management Command Police System.

In keeping with the expertise, one in every of the foremost troublesome tasks in building associate degree object-oriented model is to work out whether or not a possible relationship is healthier captured as either associate degree argument within the signature of the service (function), or as a link, aggregation, or generalization/ specialization. The subsequent are the rules obtained from our experience:

Guidline-1: A relationship should capture some ideas that applies to the matter domain or some sub-domain that's required for implementation. In different words, there should be a linguistics desiring to the connection. A service (see the property on Interface read in Section 3-5) ought to solely traverse the connection once its usage is according to that linguistics which means. As an example, take into account the link between 'Specialized Vehicle' and 'Police Vehicle' (see Fig. 3). Today, with some MI, it's potential for 'Specialized Vehicle' to figure for 'Police Vehicle'. It'd be improper and poor modelling to use the link relationship to urge to figure domain services of the opposite vehicle. A second link (Security Service) must be established to capture this totally different linguistics relationship.

Guidline-2: When the connection is 'permanent' (the static property within the initial taxonomy in Section 3-1), software package engineers should care around this term. If software package engineers take into account a state of affairs as a unit of your time (e. g. Across an occasion in our experience), then permanent implies that the connection must be identified across eventualities. Basically, if it's to be keep in memory to be used by another freelance method just like the management method between 'Dispatcher' and 'Police Office', then it's permanent.

Guidline-3: In every aggregation, software package engineers should check that that each one of the components as in the same domain and supply an equivalent purposeful or structural configuration to the whole. Apply transitivity and anti-symmetric properties tests (see the properties in Section 3-4) to examine for consistency. Note that transitivity is feasible solely with aggregations of an equivalent kind. It's very common for novices to combine components of various forms of aggregation in one aggregation. This will cause the transitivity take a look at to fail. Once this happens, software package engineers probably need to appear at the components to examine if there are differing kinds of aggregates. As an example, consider the room that

has the subsequent parts: laptop, monitors, printers, chairs, windows, floors, ceilings and walls. If we place all of those components into one aggregation, we've got mixed components from 2 different semantic aggregations. The pc, monitors, printers are process a purposeful configuration of the building; whereas the windows, floors (meaning the physical floor), ceilings, and walls are process a structural configuration of the building. These parts must be captured in 2 totally different aggregations, as they need totally different linguistics.

Guidline-4: No aggregations connect 2 objects of an equivalent kind to every different. This would violate the anti-symmetric property of the aggregation. As an example in our expertise, a 'Dispatcher' may not be associate degree combination of 'Police officer'.

Guidline-5: An association might connect two objects of an equivalent kind. As an example, the relation between the 'Reporter' and 'Reporter UI' within the management Command Police System is valid (See Fig. 3).

Guidline-6: Aggregation is commonly confused with topological inclusion. In Topological inclusion, we've got a relationship between a instrumentation, area, or temporal length which is contained by it.

Suppose within the management Command Police system:

(1) The 'Dispatcher' is within the room,

(2) The 'Incident' is in the evening, and

(3) The 'Incident' is in Colchester and county. In every case, the instrumentation surrounds the topic. However, it's not a part of the container in any significant linguistics domain. As an example, the 'Dispatcher' isn't part of the room, nor is the 'Incident' not a region of the evening. Moreover, the 'Incident' isn't a part of Colchester or county.

Guidline-7: The attributes of associate degree object, sometimes, is also confused with aggregation. Attributes describe the object as a whole sort of a recording equipment approach whereas aggregation describes the components that make the entire like white box approach. In our expertise of the management Command Police system ( see Fig. 3), the 'Route Planner' have attributes such as 'Incident Node' and 'Vehicle Node'.

Guidline-8: Attachment of 1 object to a different object doesn't guarantee aggregation. Certainly 'GPS Receiver' is hooked up to the 'Police Vehicle' and that they are a part of the system; but, 'Vehicle Radio' or 'Vehicle Stereo' are hooked up to the Vehicle, however they're not a part of the Vehicle. Note that 'GPS Receiver' provide functional support to the 'Police Vehicle', whereas 'Vehicle Radio' or 'Vehicle Stereo' don't provide any purposeful or structural support in our case study.

Guidline-9: Ownership might generally be confused with aggregation. Definitely a 'Police Vehicle' features a variety, and 'GPS Receiver' are half of 'Police Vehicle'. However, the very fact that 'Dispatcher' features a vehicle doesn't imply that the 'Police Vehicle' is a component of 'Dispatcher'. Thus, possession should be captured by a link.

Guidline-10: Multiple associations among objects are potential within which every association ought to be wont to capture a distinct semantic which means. For example, the 'Alarm' and 'Call Taker' have multiple links in our expertise (See Fig. 3).

## V. SUMMARY AND CONCLUSION

This paper reviewed the relationships among objects in object-oriented software package development and created 5 taxonomies for his or her properties. Mainly, the relationships are 3 basic varieties. This paper presents 5 taxonomies for properties of the generalization/specialization, association and aggregation relationships. The primary taxonomy relies on temporal read and therefore the second relies on structure. The third taxonomy depends on behavioural read and therefore the fourth one is nominative on mathematical read. Finally, the fifth taxonomy associated with the interfaces between objects. Moreover, during this paper the relationships are evaluated in an exceedingly case study then many recommendations are projected. The main conclusion is that the relationships should capture some ideas that applies to the matter domain or some sub-domain. They're important for software package engineers in implementation.

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