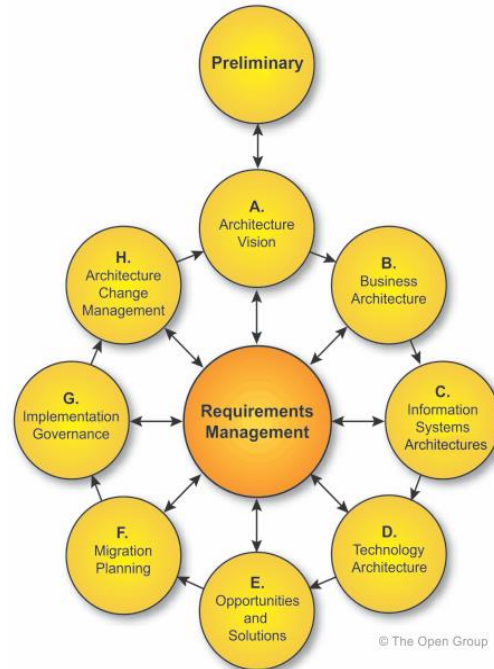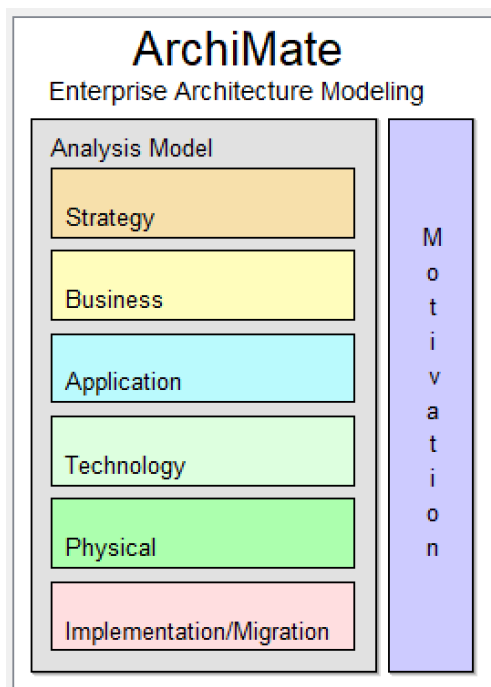# Charlie's Aircrafts

The Best Address in Town for Sightseeing Flights

An ArchiMate and TOGAF Case Study by
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March, 24th 2018

(http://pubs.opengroup.org/architecture/togaf9-doc/arch/)

The case study is focused on the basic features and the main perspectives of ArchiMate.
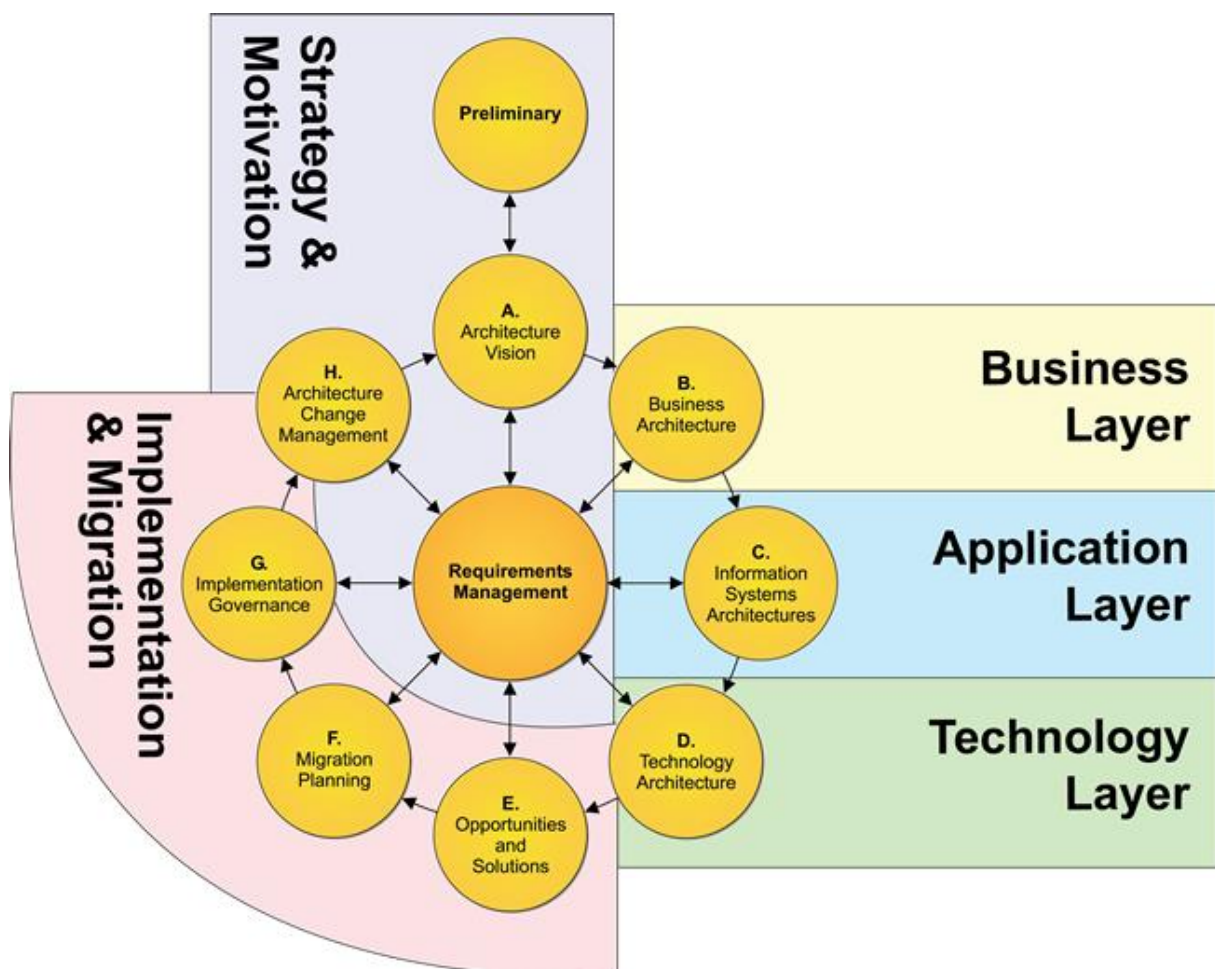
1. General Remarks

- Try to find reasonable names for the models and the elements.
- Use the documentation elements, if something is unclear.
- If something is not detailed enough, make reasonable assumptions and explain why you did it this way.

In ArchiMate 3.0 a tight connection to TOGAF (The Open Group Architecture Framework) is established. TOGAF is a framework - a detailed method and a set of supporting tools - for developing an enterprise architecture. It was developed in 1995 by The Open Group. Since then, they conducted several improvements. The latest version is 9.1. The standard consists of different phases (A to H), an overall requirements management and a preliminary phase. This structure aligns to the perspectives of ArchiMate quite well. The following image shows the connections in detail.

More details about TOGAF in the official documentation:
http://www.opengroup.org/subjectareas/enterprise/togaf/

(http://www.opengroup.org/subjectareas/enterprise/archimate/3.0-whats-new)

2. Introduction

Charlie Duwain has a lifelong love for airplanes. He got his dream job when he opened his own private airport and for the last 40 years he has been a successful businessman. Charlie offers sightseeing flights with helicopters and sailplanes for tourists as well as for interested locals. The planes are serviced internally. He has built an impressive client base all over the state, has a well-stocked inventory and a well-running organization with 20 employees (Charlie + 5 mechanics + 10 pilots + 4 employees for office activities).

Charlie has made himself a name especially in the tourist community due to his knowledge of planes as well as of the landscape and local sights. The pilots are informed well and can tell the tourists a variety of facts about the places of interest seen from bird's eye perspective.

Yet Charlie is nearing his retirement age and plans to give his business to Peter, his nephew. While the prospect of running an established business is appealing to Peter, a recent business school graduate, he is also aware that he has absolutely no knowledge of planes. Most importantly he has also no interest in learning about them.

Thus, Peter finds himself in a conundrum. He would like to have the business but he is aware that he needs to change the business design in order to be able to run it. He could hire a shop-manager who knows mechanics, flying and local sights, but he would have no way of controlling him and the business would stay local.

Peter dreams of running a large company, thus after a thorough study of his uncle's business he decides the following: Peter will expand the business and introduce new services. Helicopter and sailplane sightseeing flights remain with slight changes. A multilingual tourist guide should improve the communication with tourists from abroad. Instead of repairing only company owned planes, Peter will rent out the repair center to plane enthusiasts who want to repair their planes by themselves. He will focus on old planes and offer an intermediary service for rare parts. Three service packages (basic, silver, gold) for clients with own aircrafts will be offered. As a service for the customers he will provide space, the machines and tools as well as the expertise of two mechanics on an hourly basis. New holding areas will provide space for external planes. For a fee, private aircrafts can be shed in company owned warehouses. These customers can also use the runway for take-off and landing for a reduced fee. Furthermore, the service package is expanded by flight lessons. A teacher, who explains the technology of aircrafts as well as the traffic rules and conducts short training flights, can be booked on daily basis.

This means not only changing the business model completely but also investing in a new IT infrastructure, applications, technologies and processes to fit the strategy. Having this new business in mind, Peter also needs to manage the change process as it affects the whole company from top to bottom.

Thus, Peter consults Mike, an Enterprise Architect, in order to set up the environment. Before his final decision Peter would like to see a design of how the proposed architecture fits his goals. Mike has decided to use ArchiMate® 3.0 to model Peter's request.

3. Business Model (Phase B - TOGAF)

Until the new service business breaks even Peter will need to introduce the new services step by step: he will aim to establish the self-service business and special offers for customers but at the same time he will provide classical sightseeing flights as done by Charlie. Especially, changes in business processes like service packages, accounting and marketing have to be conducted.

Peter takes over the 5 mechanics, the 10 pilots and the 4 office employees. The office employees are responsible for accounting, billing and marketing. Furthermore, he hires a teacher and a tourist guide. Pilots and tourist guide work together in cooperation. The tourist guide is not needed every day, so there is special contract, which regulates the employment. As the mechanics are now responsible for external aircrafts as well, he hires four extra staff members, which are used especially for customer owned aircrafts and can be rented on hourly basis.

The main service stays the sightseeing flights. They can be conducted with a helicopter, which is more relevant for trips over the city, or a sailplane. As the take-off process for sailplanes is more complicate than for helicopters, the price for this package is higher. In addition, a tourist guide can be booked for all flights.

Furthermore, customers can use the aircraft service packages. There are three packages available. The basic package includes a general technical check. The silver service expands the basic package by including smaller repairs. The gold package additionally includes cleaning and refueling.

Moreover, also a self-repair service by renting the repair center is available. The space, the machines and the tools are provided by the company. In this service offer a mechanic can help on hourly basis.

As Peter wants to focus on old aircrafts, rare parts are found and ordered for customers. Afterwards they can decide whether the parts are implemented by themselves or by one of the mechanics.

Peter already went to an architect, who drew plans for new holding areas. After the construction of warehouses customers can shed their private aircrafts in the company owned warehouses. They are also allowed to use the runway for take-off (plus help for starting with a sailplane) and landing. Clients have to pay extra for these offers. If they use both services, the fee for the usage of the runway is reduced.

Flight lessons are offered for interested people. One day consists of a technological explanation, traffic rules and a short training flight.

Tasks:
1) Create a new Business Model in the TEAM tool.
2) Identify the business elements (actor, role, collaboration, process, function, interaction, event, service, product, …) from the text above and model them.
3) Connect the different elements with the correct relations.

Aircrafts Business (Business Layer)

Object count: 127
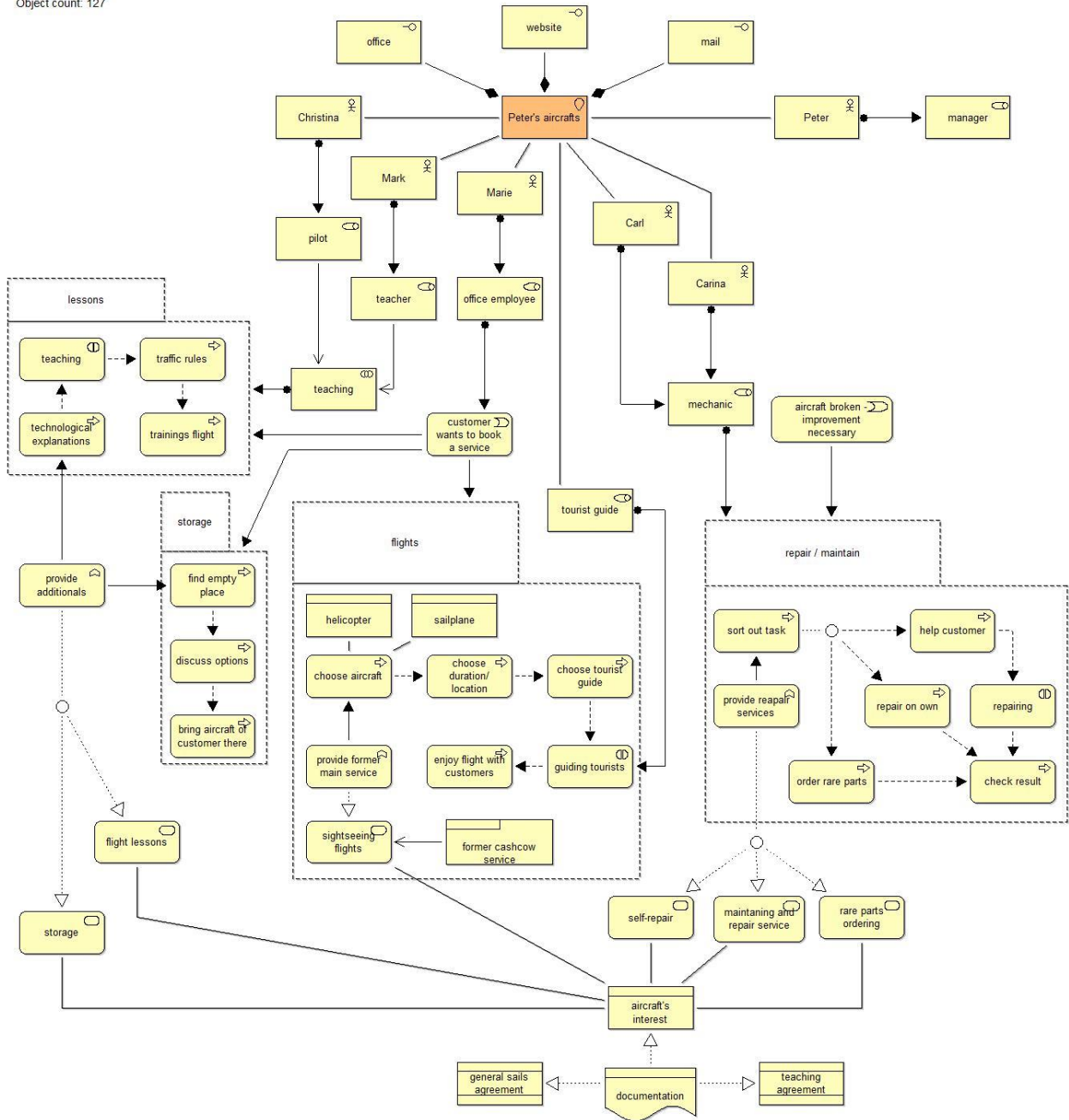
Comment:

This model only shows the most important actors. For instance, there are more than 2 mechanics, but Carl and Carina are the leaders of the team. The grouping element is used to visualize elements, which deal with similar content related aspects. Further remarks are documented in the description and note attributes directly in the diagram.

4. Application Model (Phase C - TOGAF)

The billing is conducted within the organization by the office staff. There are various ways for financial transactions. In general, bills generated by the organization are sent by email as digitally signed pdf or on postal way with a postmark. Direct debits are used for transactions between the company and suppliers. Customers can either pay directly in the office, which is located at the company area, or after receiving the bill.

The company owns a website, which is mainly for advertising purposes. Peter wants to introduce some extensions and features. The website includes a lot of information. There is information material about the company, the offered packages and the employees. Furthermore, a kind of review system should allow the customers to rate the experienced services.

Moreover, there are four ways to book a single service or an offered package. First, the website offers an online booking form. Secondly, a mail can be sent to the company mail address. Thirdly, the customers can call by phone and lastly the customer can visit the office and get advice for choosing the right package directly from the staff.

The customer relationship was very important for Charlie. Therefore, he had a customer file for every steady customer. Peter wants to use this files for advertising and to stay in contact with them regularly. To ease the process of sending adverts per mail or post, the file sheets are digitalized and the data is comprised in a customer database.

Tasks:
1) Create a new Application Model in the TEAM tool.
2) Identify the application elements (collaboration, function, interaction, event, service, data object, …) from the text above and model them.
3) Connect the different elements with the correct relations.

Aircrafts Application (Application Layer)
Object count: 90
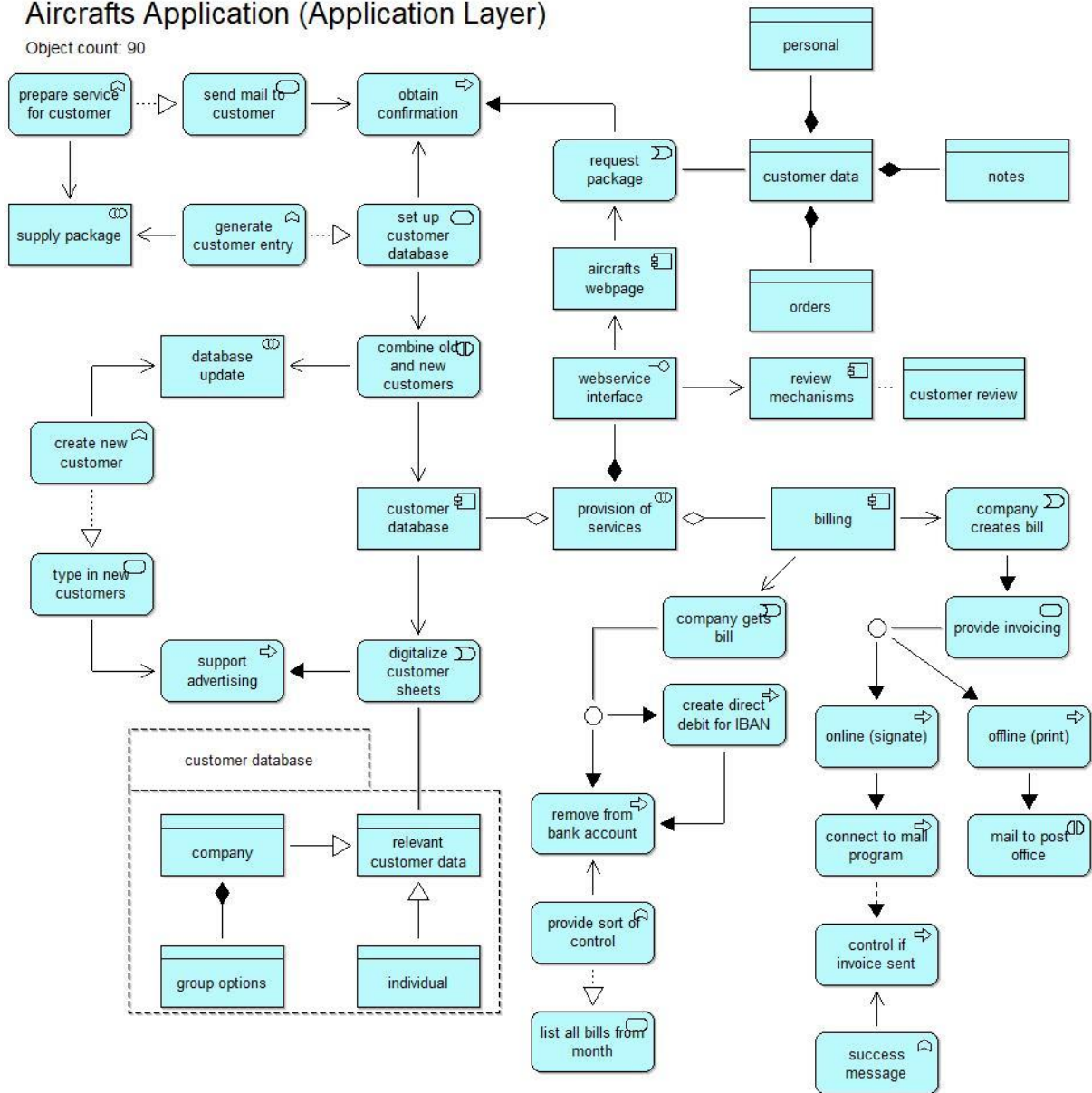
Comment:

Dates for the predefined queries were chosen reasonably. Some random dates should show that the functionality of querying valid and invalid objects. Further remarks are documented in the description and note attributes directly in the diagram.

5. Technology Model (Phase D - TOGAF)

During his discussions with Peter, Mike has identified three business processes for which he would like to propose three technology services as well as the necessary IT infrastructure (devices).

Business Layer	Technology Layer
Service Packages	Billing Diagnosis Tool for Planes
Accounting (office employees)	Accounting
Marketing (office employees)	Online Marketing
-	PC Work Place
-	Printing

For the technology layer Mike proposes the following:

- Use a server-based Billing technology service (in order or manage renting space, machinery and staff as well as issuing the necessary bills). The necessary infrastructure includes 1 server, 2 thin client computers, 1 client-server license for the technology application with 1 server and 3 users. In addition, there is a need for a network-compatible printer.

- Use a workstation in the back office for doing the necessary accounting with a corresponding technology service. The workstation has a network-compatible printer attached to it.

- Billing and accounting exchange data through an interface.

- In the plane service center there are three workstations where a diagnosis system is running. They have one central printer where clients can print the diagnosis and discuss it with the mechanics. The diagnosis system is used by the mechanics and for the self-service customers.

- All workstations can use a basic set of software: office applications, scheduler, web-browser and e-mail client.

- Use a web-based Marketing technology, like a web-server. The necessary infrastructure and technologies for the website, which should take over the main marketing part, must be provided.

Hint:
Use the note and description attributes to document information, which is hard to model in another way.

Tasks:
1) Create a new Technology Model in the TEAM tool.
2) Identify the technology elements (collaboration, function, interaction, event, service, device, path, …) from the text above and model them.
3) Connect the different elements with the correct relations.

Aircrafts Technology (Technology Layer)

Object count: 71
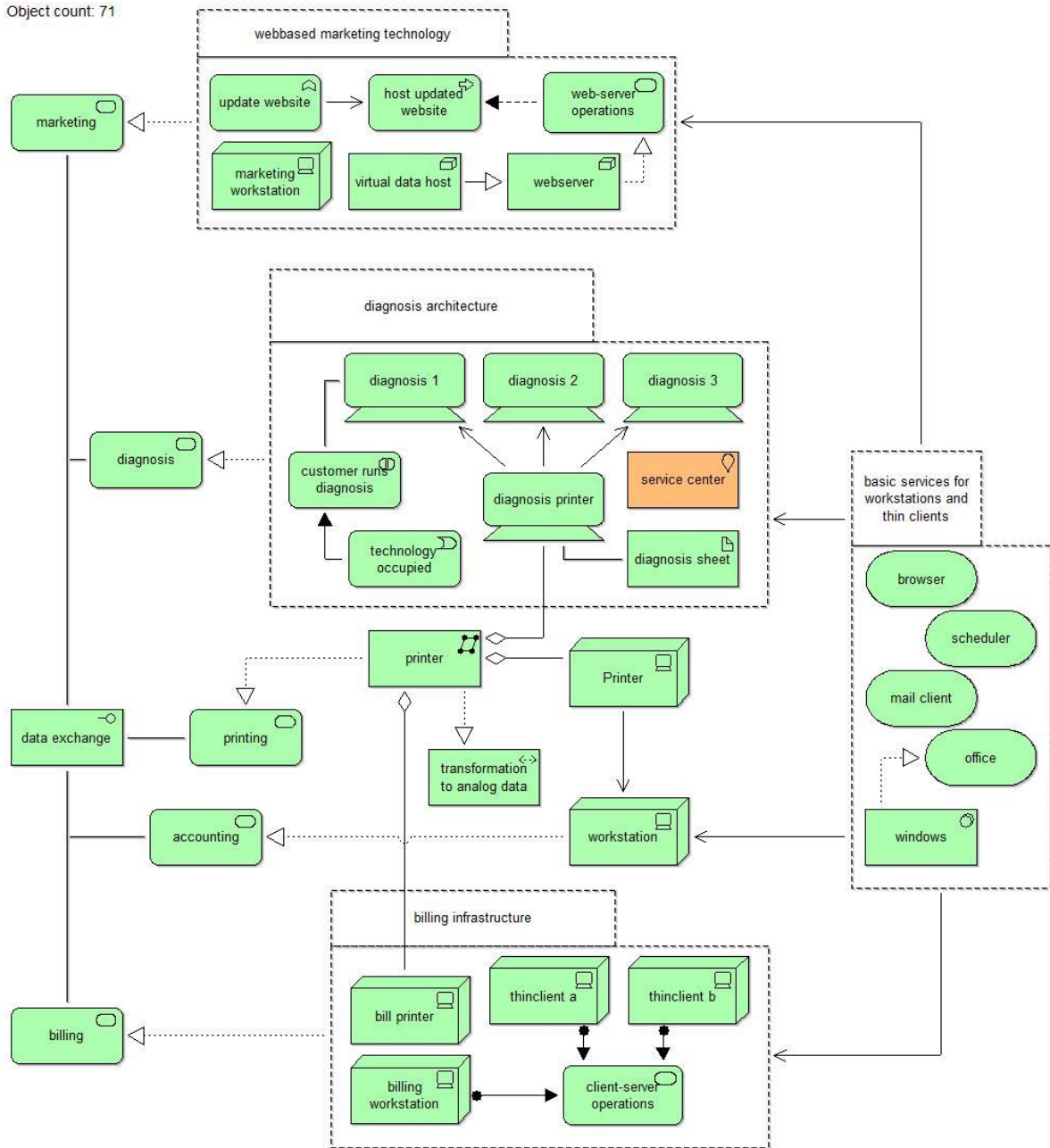
Comment:

In this model blocks, which suit to the services, are built for the infrastructure. This is done by using grouping elements. It is not necessary to connect all elements in groupings, which is very helpful for avoiding confusing and crossing relationships. The grouping element is used to visualize elements, which deal with similar content related aspects. Further remarks are documented in the description and note attributes directly in the diagram.

6. Analysis Model (comprises all phases of TOGAF)

For Peter, to be able to offer his plane business „as a service", he needs to connect his equipment and assets to the IT applications (especially to Billing). He has one facility (the plane business) which is divided in three subfacilities: the service center, the client area (tourists can wait there) and the back office. He equips his rentable machines with chips which register whenever the customer rents them (in minutes). In order to unlock and start them the customer must swipe his card through a slot attached to the corresponding machine.

The service center owns:

- 6 drilling machines
- 5 welding equipments
- 4 toolboxes
- 2 machines for testing rotor blades
- 1 air conditioning service equipment

Each machine has a chip-reading device, which communicates through the communication network with the central server. As soon as the customer swipes his card on a machine, the user logging service and a time logging service are activated. As soon as the machine is put back in its place an off switch is activated and the two services receive the information that the machine is no longer in use. Immediately afterwards, the services send the customer number, customer name as well as the machine used and the time it was used to the Billing application which saves the data in the customer's account. At the end of the day the Billing application automatically dispatches the invoices to the clients via e-mail and charges the credit cards.

Take the most important technology and application elements and bring them together with the business elements.

Overall Peter's goal is to increase profit to have spare capital for planned investments. At first, Peter will need to create a (business) service catalogue for self-servicing. He will also need to optimize the space usage of the workshop in order to be able to offer self-servicing time slots to potential customers. Thus, he will need to improve his Operational Excellence by standardizing the mechanics services he offers to customers and setting up a centralized IT system. For both the self-servicing part of the business as well as the mechanics service business he will need to improve the service management capabilities of his business. Additionally, Peter recognizes the need to build up the IT Operations and Management capabilities. Thus, he plans to invest in IT Resources (additional equipment, IT applications, cloud-services etc.) and in human resources. He plans to offer several training programs to the existing system administrator and also to hire new IT staff.

Tasks:
1) Create a new Analysis Model in the TEAM tool.
2) Identify the most important elements (strategy, physical, motivation, …) from the text above and model them.
3) Connect the different elements with the correct relations.

Aircrafts Analysis (Analysis Model)

Object count: 116
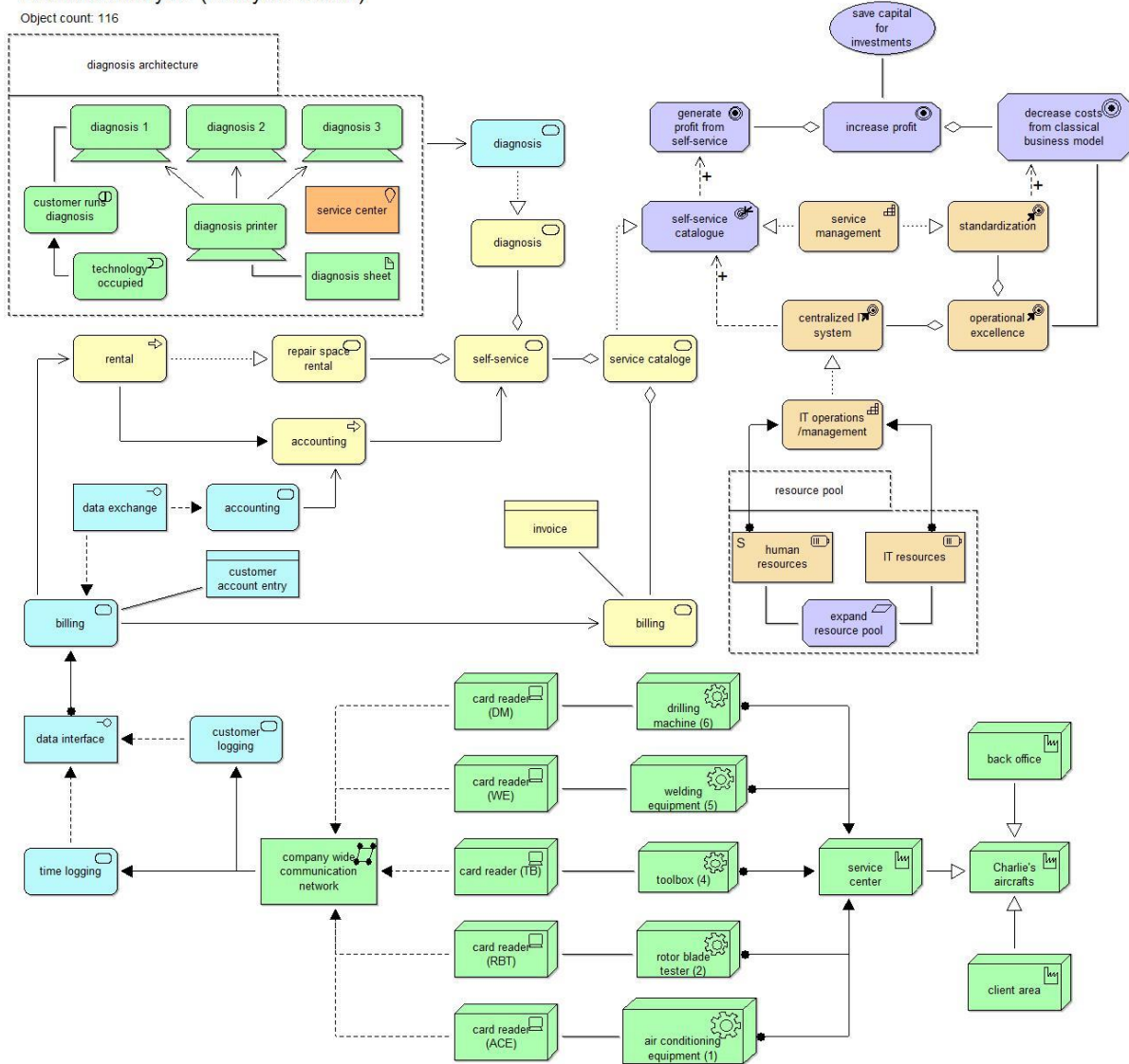
Comment:

Not all components are modeled in this diagram, since it would get too complex. The main elements of the different layers should show possible connections across the various model types. The grouping element is used to visualize elements, which deal with similar content related aspects. Further remarks are documented in the description and note attributes directly in the diagram.

7. Analyze Models

Responsibility Management:

The assignment of responsibilities should enforce a higher level of production and engagement in companies. If somebody is responsible for a specific component or task, he is more likely to give his best, as if the possible failure does not bother him at all. Technology layer elements can be connected to the entities business actor and/or business role of the business layer. The following elements are concerned:

- Node, Device, System software, Technology collaboration, Technology interface, Path, Communication network, Technology function, Technology process, Technology interaction, Technology event, Technology service, Artifact (Technology Layer)
- Business actor, Business role (Business Layer)

Tasks:

1) Define the necessary attributes (interrefs).
   - ➔ attribute: "Responsible for"
   - ➔ model: business model
2) Conduct one Responsibility Management Analysis.
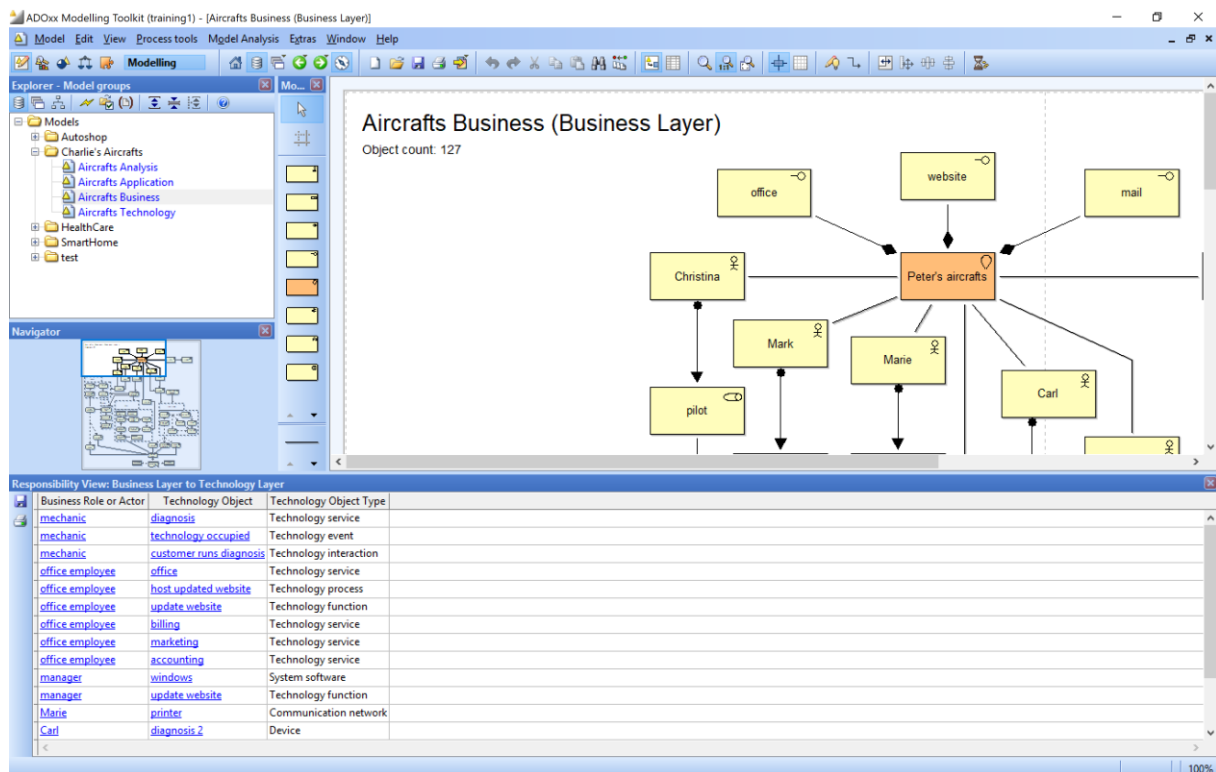
Responsibility View: Business Layer to Technology Layer

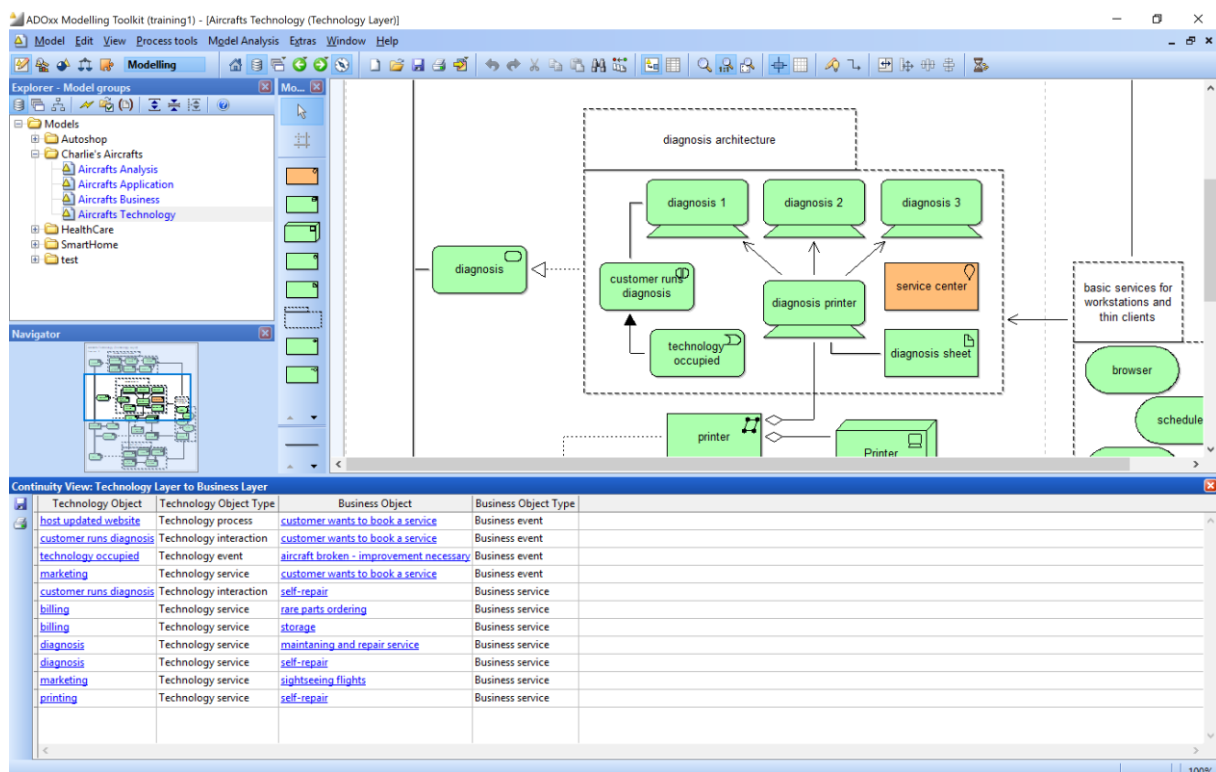| Business Role or Actor	Technology Object	Technology Object Type
mechanic	customer runs diagnosis	Technology interaction
mechanic	diagnosis	Technology service
mechanic	technology occupied	Technology event
office employee	accounting	Technology service
office employee	billing	Technology service
office employee	marketing	Technology service
office employee	office	Technology service
office employee	host updated website	Technology process
office employee	update website	Technology function
manager	windows	System software
manager	update website	Technology function
Marie	printer	Communication network
Carl	diagnosis 2	Device

Comment:

Actors and roles from the business layer have assigned technology objects. If only the role is assigned, there is no specific person responsible. If a name (an actor) belongs to a technology object, a specific employee is responsible for this object. This is not very reasonable and should be avoided, as this person can be ill, for instance.

Business Continuity Management:

The impact of several components on others plays an important role for maintaining a running system. Therefore, a connection between business and technology models should be established. The goal is to determine the impact of a technology element (function, process, interface, collaboration, interaction, event, service) on a business layer element of the same type. Business continuity is needed in general, but it is especially important, if there is a broken component, as it can lead to a breakdown of the entire system. Ideally, a broken component can be circumvented very fast to maintain the business and to minimize the damage regarding wasted time, resources and money.

Tasks:

3) Define the necessary attributes (interrefs).
   ➔ attribute: "Influence on"
   ➔ model: technology model
4) Conduct one Business Continuity Management Analysis.

Continuity View: Technology Layer to Business Layer

| Technology Object	Technology Object Type	Business Object	Business Object Type	
host updated website	Technology process	customer wants to book a service	Business event	
customer runs diagnosis	Technology interaction	customer wants to book a service	Business event	
technology occupied	Technology event	aircraft broken - improvement necessary	Business event	
marketing	Technology service	customer wants to book a service	Business event	
customer runs diagnosis	Technology interaction	self-repair	Business service	
billing	Technology service	rare parts ordering	Business service	
billing	Technology service	storage	Business service	
diagnosis	Technology service	maintaning and repair service	Business service	
diagnosis	Technology service	self-repair	Business service	
marketing	Technology service	sightseeing flights	Business service	
printing	Technology service	self-repair	Business service	

Comment:

As there was a deeper interest only in business event and service, this configuration was chosen in the interaction window. Therefore, all technology objects, which have an influence on business events and/or services are listed.

Predefined Queries:

The introduction of attributes, which represent dates and include a time factor in the model, increases the expressiveness and the value of the models. The application layer components have an attribute for lifespans, as they can be outdated or valid. Therefore, the attribute "Valid until" is included for application component, application collaboration, application interface, application function, application interaction, application process and application service.

Tasks:

5) Fill out dates for the application elements.
   - ➔ attribute: "Valid until"
   - ➔ model: application model
6) Conduct a Predefined Query.
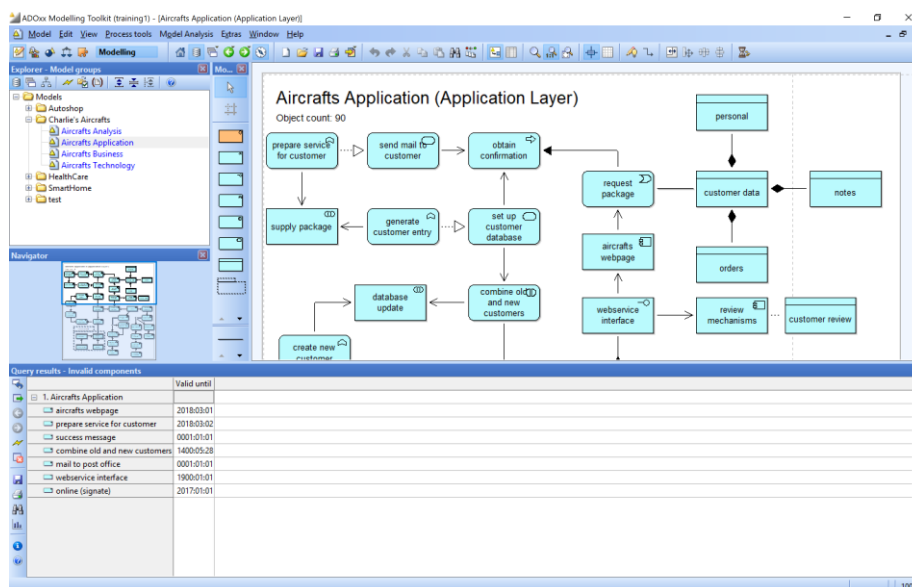
Query results - Invalid components	Valid until	
1. Aircrafts Application		
aircrafts webpage	2018:03:01	
prepare service for customer	2018:03:02	
success message	0001:01:01	
combine old and new customers	1400:05:28	
mail to post office	0001:01:01	
webservice interface	1900:01:01	
online (signate)	2017:01:01	

Comment:

The conducted query shows the invalid component for the date: March 14th 2018
As the valid until date is a past date, the application components are outdated.

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