

Component

PxM-30 « Modus : The Praxeme methodology »

Guide of the Geographic Aspect

Objective The company system's geography seems to be an obvious aspect, which does not require any particular modeling effort. Anyhow it can be an opportunity to innovate. In that event, it might have significant consequences.

Geographic aspect's modeling gathers information which will condition the hardware architecture and the system's sizing.

- Content**
- Definition and goals of geographic representation
 - Products : reference framework and pattern
 - Positioning into the production line
 - Geographic modeling processes

Author Dominique VAUQUIER

Translation Pauline Danino (INSA – Institut National des Sciences Appliquées – Rouen - ASI)
Christopher HEIN (INSA Rouen - ASI)
Translators coaching: Yvon Benoist (INSA Rouen - ASI)

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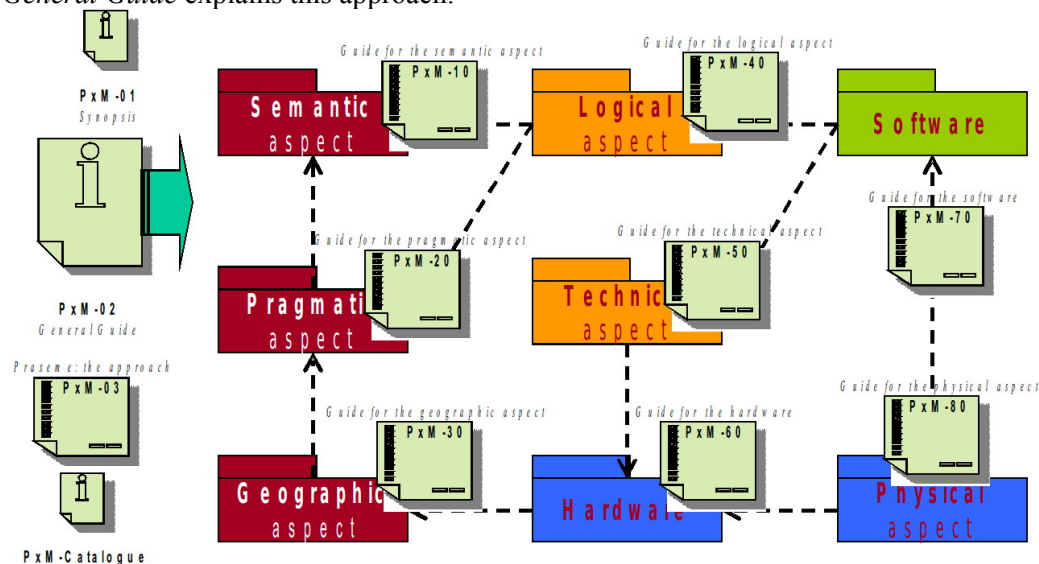
Configuration Elements

Component's Position

Position into the documentation

Figure PxM-30_1.
Methodological
Repository Architecture

Praxeme methodology is structured as the Enterprise System Topology's aspects. The *General Guide* explains this approach.



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For more information on the Praxeme initiative: <http://www.praxeme.org>

Availability

This document is available according to the rules defined thereafter. Sources (document and graphics) may be obtained on explicit request.

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Validation team:

- Dominique Vauquier (Praxeme Institute)
- Fabien Villard (Praxeme Institute)
- Yvon Benoist (ENSA Rouen)
- Anthony Jervis.

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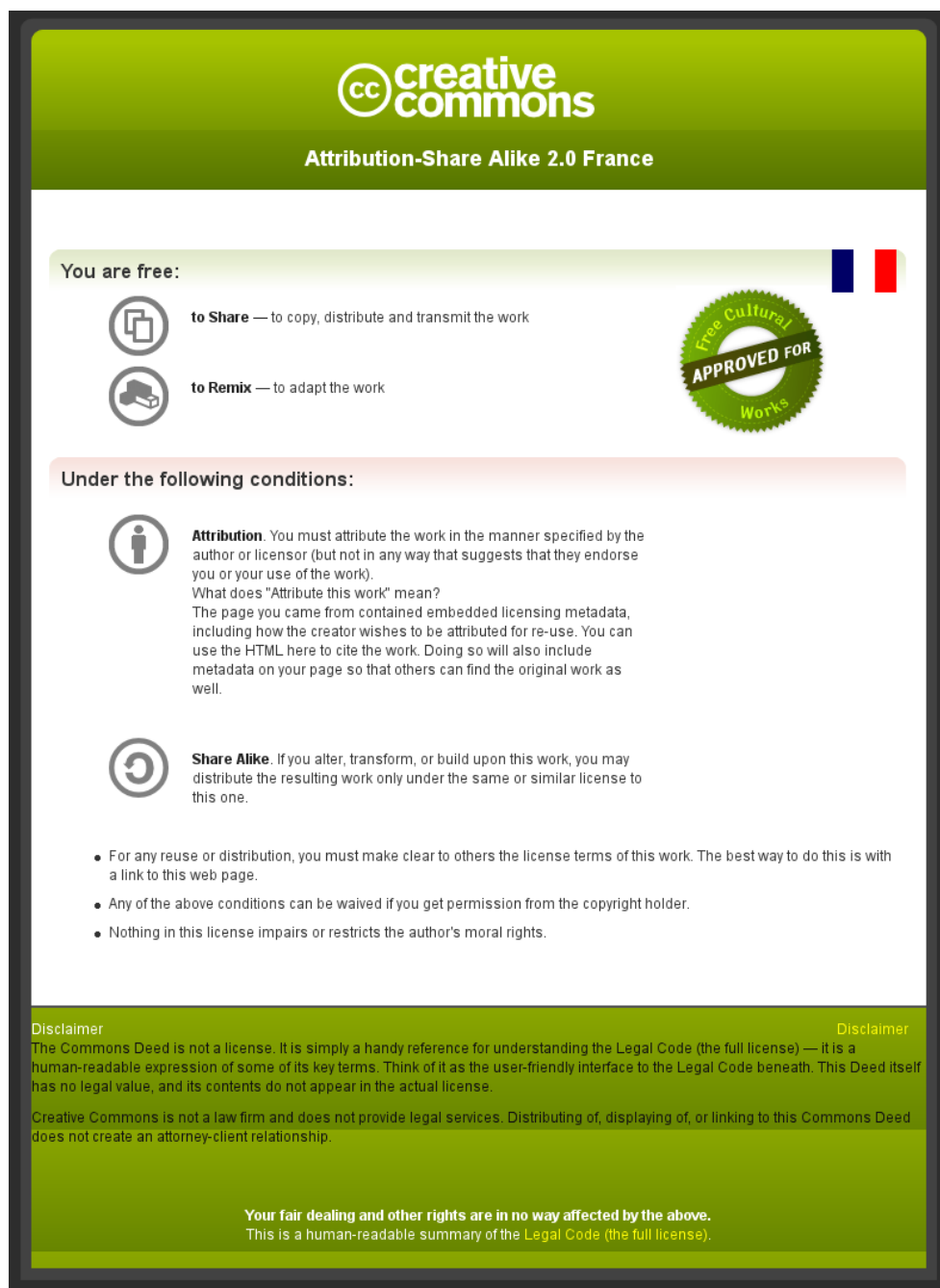
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- Dominique Vauquier for the document
- The *Praxeme Institute* organization for the Praxeme methodology in its entirety.

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Exergue

« Experience without theory is blind, but theory without experience is mere intellectual play. »

Immanuel Kant

« It is not due to my taste for difficulty that I launch myself into that undertaking and I persisted in it. It is due to my fatal love for the two enemy goddesses whose hand to hand is deadly to both, universality and concrete. »

Edgar Morin, *Human Complexity*

Introduction

An aspect that do not change from one project to another

Situation in the method's reference framework

After the semantic model (« core business ») and the pragmatic model (organization), the geographic model is the third and last model composing the external view of the company's system. The geographic model is part of the upstream models that is to say it is perceived by the system's actors.

The geographic aspect gathers information which answers the question « where? »: where are the actors located? Where is the activity taking place?

Guide's goal

There is no peculiar difficulty to model the geographic aspect. This document gathers information that needs to be expressed in order to organize the technical architect's work

Area and circumstance of implementation

The geographical representation of a company or an organism is the representation of its implantations: headquarters, local directions, agencies, warehouses, logistic and computer centers, etc. For the target, some new reflections step in:

- the itinerant activity of some actors (eg salespersons)
- connection persistence with the company, thanks to intelligent terminals, smart phones, connected PDAs which encourage work from home
- openness to partners (in a company network)
- geographical rearrangement of activities to get benefits from new schedules (for example helpdesk activities round-the-clock)
- public access via Internet.

These orientations will condition the choices of hardware and technical architecture. They belong to the system's main policy which reflects strategic choices. Their range is wide: it is on the system's scale. Nevertheless, they must be reexamined before each project.

Introduction (suite)

Establishment of a pattern of the geographic aspect: its products and its procedures

Guide's content

After defining the geographical establishment of a pattern and the sensitization to its issues, the guide gets onto three dimensions:

- products ;
- processes ;
- procedures.

Products

Theoretically, a company's geography is described once and for all. Several representations can coexist: one in order to describe what exists or the impositions, and another one to describe the goal defined in a new display strategy.

Nevertheless, projects might produce their own geographic model, in case that there is not a preset representation, or in order to bring details.

The guide specifies the type of information that the geographic model must contain.

Processes

Without prejudging the reference process chosen for the projects, the guide positions the geographic aspect 'pattern establishment into the process.

Procedures

The last part of the guide offers different ways of doing things and the good practices in order to carry through the geographical pattern establishment. It contains among others advice to use UML. We will see that UML's contribution on that subject is quite narrow.

Definition and goals of geographic representation

Innovation on this aspect strongly impacts the use of the system

Approach

From an information technology perspective, the geographic aspect seems limited to a set of clear and unquestionable constraints. The information system would simply have to be built around these constraints, thus limiting geography modeling to an analytic approach.

However, invention always works its way into design, even through massive and blinding evidence. Applied to business, the design of the geographic aspect may lead to radical changes. It is tied to the strategic orientation of the company and goes hand in hand with how it is organized.

Deep trends at work in the economy determine strong choices for the geographic aspect:

Outsourcing of activities,

new forms of organization: working from home, virtual company, network-oriented company,

mergers, acquisitions and partnerships that constantly redefine the substance and the boundaries of the company.

Increasingly, the company appears to be a system of systems. Its geographic dimension thus takes on a new importance, especially as presupposed fluid and universal communication compounds the requirements of system design. Moreover, a growing part of the geographic aspect is being dematerialized by the convergence of network connections and mobile devices characteristics. Some functions are relocated in real time to benefit from other time zones brought by internationalization. On this aspect as on others, the designer must keep an open mind.

The stakes

The constraints and decisions with respect to the geographic aspect are almost always formulated simply and quickly. On the other hand, they are fraught with consequences for the remainder of the design.

They condition the solution's features and determine its everyday functions, even more than do technological choices.

That is why, even if it seems simplistic at first glance, it is important to carefully articulate the geographic constraints and possibilities - if only to keep track of what seems obvious today and will have to be questioned in the future.

The goals of the geographic model

The description of the geographic aspect specifies the sites on which the system¹ is deployed, as well as the spatial conditions of its operation.

This information will be designed into the technical solution, as absolute constraints.

¹The term "system" refers to the company and is not limited to the computer system. One can imagine non-computerized sites (for example, a mobile agent). The geographic model should include it in order to identify opportunities for improvement.

Definition and goals of geographic representation (Continued)

The terminology of geographic modeling

The terms

In what terms does the modeler - analyst or designer – deal with the geographic aspect?
How will we find the logistical elements and computer system constituents?

The following topics answer these questions.

Here, by 'terms', we mean the syntactic categories of modeling.

The general terms

Traditionally, the geographic aspect is described in terms of:

- sites (located);
- types of sites (for example, for a company : Headquarters, Regional headquarters, Branches...);
- networks (these are physical or virtual networks that link those sites together to ensure communication between the players, whatever the mode);
- a specific factor: the mobile station (which imposes specific constraints for the technical architecture).

Illustration

For example, the table and figure below summarize the geography of an insurance company.

Figure PxM-30_2. Summary table of sites (example)

Type	Definition	Number
Headquarters	Single site of general management and functional departments	1
Regional headquarters	Houses sales supervision and production of a region	8
Management center	Production site providing file treatment	20
Departmental office	Base for commercial activities and showcase for the group's customers	81

Definition and goals of geographic representation (Continued)

The terminology of geographic modelization (Continued)

Illustration (continued)

Figure PxM-30_3. The map of SMABTP sites



Keys :

- UGR : regional management unit (unité de gestion régionale)
- UGS : specialized management unit (unité de gestion spécialisée).

These types of site correspond to specific activities and are defined in the organization. They are associated to types of players (roles) and processes.

Commentary

This illustration is a good example of natural representation of the geographic aspect. It shows how the types of sites are projected on the territory of the company. The relationship between the geographic model and the practical model is therefore very strong.

Such a representation is a good starting point but does not reveal everything about the geographic aspect. Indeed, we still need to study how these real sites connect with each other and communicate.

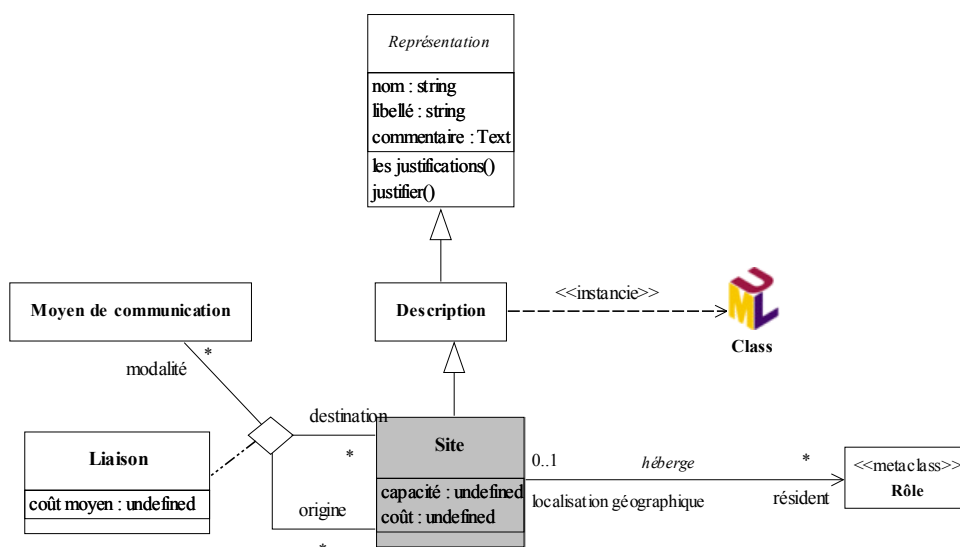
Definition and goals of geographic representation (Continued)

The meta-model of the geographic aspect

The meta-model

Praxeme is based on a meta-model whose aim is to establish the terminology for the entire production line and all aspects². The class diagram below shows only the concepts involved in modeling the geographic aspect.

Figure PxM-30_4. Meta-model diagram for the geographic aspect



The site

The site is the central concept for the geographic aspect. It is defined as a geographical location where the organization's activity is performed.

Its features are:

its location (for exemple a postal address and/or a GPS location - provided that a clear standard is adopted to chose between "main door center", "middle of the building", "reception"...);

its capacity (for example, the number of employees or the number of customers who can be comfortably accommodated, or in production volume: number of items that can be produced, number of files that can be treated...);

- the type(s) of players on-site;
- the type(s) of activities.

Definition and goals of geographic representation (continued)

(continued)

Site types

The types of site (branch, office, national / regional headquarters, etc.) are eminently organizational concepts. Rather than adding another meta-class (such as "Type of site"), the model uses the meta-class Role for expressing the types of sites. The meta-class Role comes from the package "Pragmatic aspect" that incorporates the activity modeling concepts. The role itself is associated with types of activity (meta-class Practice3).

We will say that a site is housing a role.

Thus branches or management centers are generically defined as collective roles, aggregating specific activities. A site instance (the Bordeaux branch) represents a specific geographical location and is associated with the role that fits. From this role, we can deduce the activities that take place on this site and the types of players who are accommodated there.

Exchanges

The sites are interconnected to form one or more networks. These links are established through all available means of communication:

- mail and equipment transport (in-house or subcontracted);
- means of passenger transport (private or public: shuttle provided by the company, company fleet, public transport networks);
- means of telecommunication (teleconferencing, videoconferencing);
- electronic means (e-mail, work flow, shared resources, etc..)
- The geographic model covers all means of communication because they can contribute to different types of activity. Their capacities and limitations determine the functioning of the processes.

The meta-model returns this notion of communication through the associative class "Link", which is the manifestation of the third association "exchange". An instance of this association encompasses two sites and a communications medium. Indeed, between two sites, there may be several means of communication: physical and electronic.

The cost of the link is measured in time or money. The link is also characterized by a minimum time frame. This data is accounted for in the process design and the choice of logistical means. Scenarios for a future solution can then be compared for cost.

Communication

The concern in the geographic aspect is the continuity of the information system. Can a given piece of information be available anywhere, anytime? We must also ask: at what cost? The answer to this question may vary depending on the site (case of foreign sites). Distance is part of the geographical terminology. A "virtual" distance should be introduced, reflecting the communications cost from one site to another in a realm of activity².

²Electronic space nearly cancels distances compared to physical space or postal mail space.

Products: frame of reference and model

Documentation of the system's geography

Content

The geographic model is not very difficult to develop. The examples given above give an idea. The information underlying these charts is neither vast nor complicated.

It is primarily preparing the work for the technical architect. For this, the only requirement is to express all space constraints and conditions that the system will have to comply with.

In accordance with the established practice in Praxeme, we distinguish:

- the model, set up at a project level;
- the frame of reference, guiding the action over the long term.

Geographic Repository Added Value

By its nature, the representation of the geographic aspect is "universally" applied: it is above all an element of the frame of reference. There should be few possible variations on this, from one project to another. The major changes in the geographical description come from the strategic choices when they address this aspect.

The frame of reference contains the representation of the company and the gauging and cost data. It presents the thoughts that justify the company's geography and the various possibilities considered. To go further and foresee the long-term investments, the geographical frame of reference may also include scenarios for eventually renewing the concept.

Project Level

In practice, projects merely reiterate the geographical representation, developed by the activities of global scope.

If they do not reinvent the geography of the company, projects must still integrate it according to their own objectives.

It is interesting to identify the sites and types of sites affected by the new solution. Similarly, groups affected by the change can be identified.

For example, claims management concerns all the management sites and a third of the associates of the insurance company. The distribution of these groups, both geographically (on the sites) and organizationally (by type of player) should be specified..

Anticipating

For both the frame of reference and the models, the designer plans ahead and anticipates foreseeable developments. The thinking is rooted in strategy development and market analysis. The designer consults the person or persons holding that knowledge within the company (General Management, Marketing, strategy consulting...).

Content of the geographic model

Networks

The geographic model describes all means of communication linking:

- the players in the company system, among themselves;
- this system with its environment.

These networks take various forms, from physical networks (transport of passengers, mail, equipment) to electronic networks (computer system, computer networks, Internet, extranet or intranet).

For each network contributing to communication inside the system or to the outside environment, the model includes quantitative information such as: frequency (for a shuttle), time (minimum, medium, maximum) and costs.

This information is necessary to assess the processes' behavior and, later, to gauge the resources.

The means used to activate these networks should be integrated into the design of the process equipment.

Designing example

Let's illustrate a reasoning behind an actual geographic aspect.

A company announces that improving customer relations is a strategic goal. An intermediate goal is to shorten claims processing times, with the objective of processing 80% of claims within 24h, the remaining 20% subject to a special procedure. This goal requires close cooperation between the after-sales service, customer service, technical center – where the expertise is centralized - and warehouses - where the spare parts and articles are.

The time requirement leads to consider two types of measures in the geographic aspect:

- move closer or merge the sites on which the activities are currently spread;
- connect these sites by regular links, consistent with the required time constraints.

Other measures will accompany this policy. For example:

- in the pragmatic aspect, appointing a person to coordinate these services or setting up a horizontal organization;
- in the information technology aspect, developing a single tool covering the entire life cycle of the claim and accessible to all players involved.

Measures of a geographical nature are, of course, the heaviest and the most expensive. They sometimes have a dramatic impact on human resources. Nevertheless, for a whole range of problems and goals, they hold the most radical and most effective solutions.

Innovation in the geographic aspect

Crisis context

Let's take another example.

A company keeps a careful watch on its crucial processes. In addition to routine activities, it identifies crisis situations for which it wants to prepare itself with the greatest care. Such situations arise from, for example, an alert on the market, a production failure, a financial or physical attack...

In any case, a crisis unit must meet at short notice with the director. The composition of this unit, determined by the organization, varies depending on the type of crisis.

The geographic design provides a vital contribution to the solution. Among other measures, we can mention:

- the creation of a war room (location of the dedicated room; its equipment to be described in the equipment model);
- the allocation of emergency transportation for members of the crisis unit (the solution takes into account warning and transport lengths);
- priority links with other sites involved in crisis management (for example, live video-conferencing with a factory's control center)...

For some problem categories, the war room may be mobile, its mobility providing both discretion and proximity.

Trends

The geographic aspect is not a narrow dimension whose content is given once and for all. It may be a basis for innovation. Let's look at the following trends as examples:

- The network-oriented company blurs traditional company boundaries. This concept enables, at a lower cost, to increase the company's presence in the geography of its market or production base. This concept is mainly organizational in origin, but these effects on the company's geography should not be overlooked. A network of closely connected companies multiplies the potential contact points for mobile resources.
- Mobility has a place in the geographic aspect. It is based in practice on technological possibilities - examined in the following aspects. Too often, its development is blocked by prejudices about the organization, prejudices reflected in the pragmatic model. Its economic role is assessed in the geographic model. Often, benefits will be observed because the itinerant worker takes up little or no space in the company...

The place in the production line

An aspect masked by the obvious

In methods

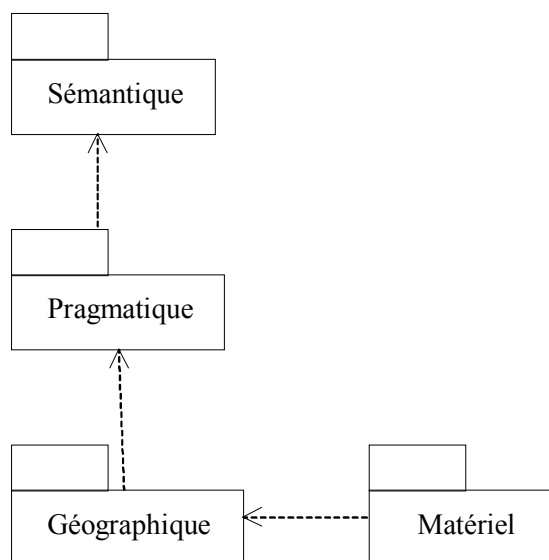
In most software development methodologies, the geographic aspect has no place³. This reflects the strength of assumptions about the solution. The location of the units appears obvious. This trend is reinforced when the viewpoint narrows on a sub-system, instead of expanding to the system and its environment or targeting the real purpose.

Such an attitude eliminates a wide range of possibilities and inhibits design.

Position

The Enterprise System Topology positions the organization (the pragmatic aspect) as a prerequisite to the geographic aspect. The discussion above on the type of site confirms this connection.

Figure PxM-30_5. The place of the geographic aspect in the Company System topology



Organization and geography are closely related

The intended purpose of topology

The topology of the company system is a schema for storing data concerning all aspects of the company. The aim of this method is to ensure thorough data collection and decision making. One constant concern is to limit as much as possible the relationships among different data and to arrange it in the simplest way possible. For example, a model cannot make reference to a model of an aspect to which it is not connected. Topology establishes inter-aspect dependencies in order to limit the number of links between documents.

³ A remarkable exception: the TACT method. It is not the same in domains other than software engineering. In particular organization design especially when it is oriented by economic duties, can quickly embrace geographical solutions (off-shoring, out-sourcing...) even by penalizing other aspects (resources)..

The Consequences

The consequence of this control intent is that the geographic model can make reference to the pragmatic model, but that the reverse is not allowed.

A geographic model identifies the sites and provides them with site types that are defined in the pragmatic model (see p. 7).

However, the organizer developing a procedure must, in certain cases, take account of the geographic constraints on the business. It is useful to recall that the players involved in a process do not all work at the same site. For dimensioning and adjusting the process, the organizer must take into account the costs and delays of communication between the sites and the players.

Good Practice

This dilemma fades when we distinguish between the dimension of the Product and that of the Process. The topology of the company system is part of the former: it is not intended as the basis for the construction of the company system; it simply describes the components of this system and the legitimate relationships among them. These relationships are purposely reduced and simplified, in order to better organize the body of documentation that describes and prescribes the system.

The logic of the process that builds this product is different. In the process, the organizer or designer of the process can take in at a single glance both the pragmatic geographic aspects. He will even need some knowledge of the logistics and information technology resources to develop a realistic solution that takes advantage of the technological possibilities.

The fact that every agent has a fax on his desk or that the mobile station is connected everywhere via the Internet condition the design of the process. Therefore, when modeling the processes, the organizer must be aware of the general conditions of the geographic aspect and hardware. He/she does so without explicitly referring to the models of these aspects. But this applies only to the very process of designing. The result of this action - the documentation, the model's contents -, the cross-references and references strictly comply with the topology method. On the other hand, the pragmatic model does not refer to the sites and other geographical information.

Some would consider this rule excessive; the primary concern behind it is to handle and structure a huge mass of information.

The impact of geographic modeling

Structural Decisions

The structure of the architecture is absolutely preconditioned by the constraints and choices with regard to the geographic aspect. These decisions concern the physical architecture. Indeed, if the designer wishes to systematically resort to automation and communication possibilities, he must equip each site (each geographical unit) with the appropriate equipment. The definition of the site, its location and its relationships with other sites condition the physical architecture.

Phasing

Accordingly, the study of the geographic aspect takes place very early. Depending on the case (projects, long term plans...), we can adopt one of the following approaches:

1. Taking for granted the underlying assumptions on this aspect: in this case,

there is no need to dwell on the subject; a simple block diagram will suffice.

2. Bringing out and formally expressing the presuppositions: this is necessary when there are skills to be shared across the all design.
3. Making the design of the geographic aspect part of the strategic planning or the system policy.
4. Unlocking the imagination and raising the boldest hypotheses to submit them afterwards to assessment.

Geography modeling finds its place in the process according to the adopted approach.

A matter of level and view

At the project level, it is likely that the only tenable position is the first one. In this case, the representation of the system's geography is absorbed into the general architecture activity. A phase called "architecture design" incorporates this activity. The impact on result is low: it only adds a diagram, not necessarily formal.

The second approach adds value to the overall study of the company and its future. It contributes to the analysis of the company, of its culture, of its sociology and its organizational methods.

With the last two options, the system's geography is at the center of attention and finds a place among seminal ideas for any new generation solution. The logical process of design is on the same level as the strategy.

In this context the "geographical" design finds its true place in "global level activities"⁴.

⁴ See the section with the same name in PxM-02, *General Guide*

geographic modeling procedures

Representation how-to

Non-formalized representations

UML does not offer a representation specifically focused on the geographical dimension. The modeler can, therefore, legitimately resort to standard or intuitive representations of this aspect:

- Maps;
- Iconic diagrams;
- Block diagrams, without any particular formalism.

Example

The illustration on page 11, for SMABTP (map found on the company's website). In the full geographic model, the mobile stations and the interfaced systems should be added, partner systems in particular. In some cases, the association between two companies leads to establishing links between the operational units (sales force association) or, at the other end, between the functional departments (connection of computer systems, merging of logistical roles...).

The example on the next page shows the level of complexity that can be reached. It concerns a UAV system, involving several control stations (UCS) and covered by several communications networks.

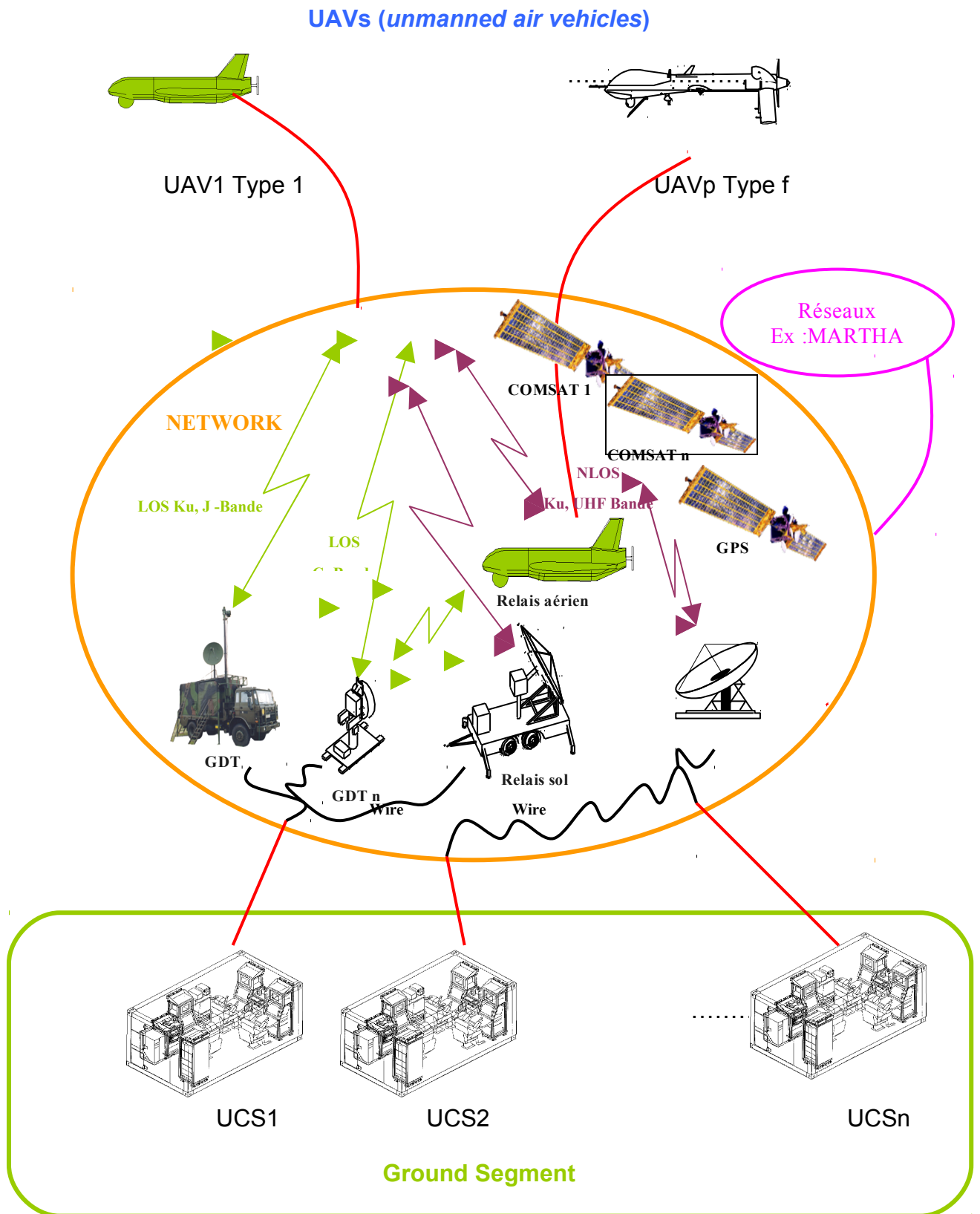
Benefits and drawbacks

This type of representation has the advantage of facilitating communications: it is relatively intuitive and does not raise understanding issues.

Conversely, the informal nature of these representations has the following disadvantages:

1. The elements of these diagrams are not linked to the model's elements.
2. The lack of formalism can lead to the insertion of different kinds of elements into these diagrams.
3. These two disadvantages harbor a third: these representations might always be unsystematic, neglecting factors or hypothesizes that could contribute to the system's design.

Figure PxM-30_6. The geographic aspect of the UAV system: example of an informal representation



The contribution of UML: the deployment diagram

The possibilities

Even though the UML inventors were not concerned about the geographic aspect, there are still ways to bend the standard to our representation requirements:

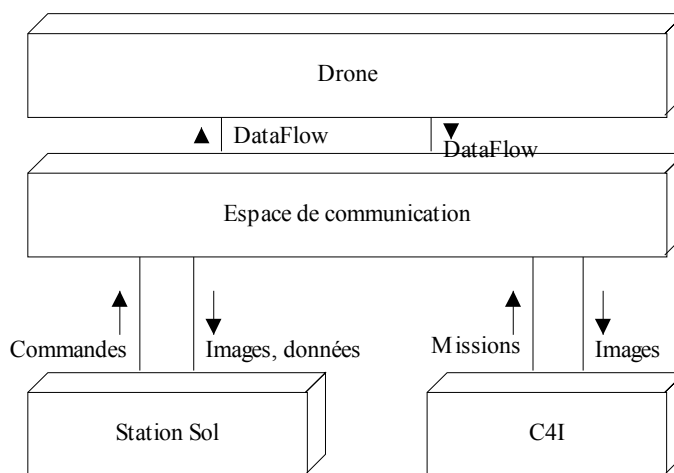
- The context diagram based on a collaboration diagram7;
- The deployment diagram

Deployment Diagram

The deployment diagram represents the practical aspect: the system's "nodes", meaning the machines or physical devices that make up the system. It will be used, in accordance with its purpose, in the models of the material and physical aspects (see PxM-60 and PxM-80).

Strictly speaking, the modeling elements particular to this diagram are not the terms of the geographic aspect. We can, however, allow ourselves a small infringement as shown in the figure below. Please note: the "data flows" (the links with arrows) are an addition to UML from the Objecteering tool.

Figure PxM-30_7. The UAV system represented by a deployment diagram



Limit



Because it is UML, this representation enables linking its elements to other elements of the model (for example, the types of players). This is a significant advantage. It should be noted that these links are only references: they are not included in the UML meta-model.

Another limitation is the inability, in UML 1.4, to break up the nodes: we will not be able, in the model of the material aspect, to show that a site "contains" multiple equipments (computers, peripherals...), unless we settle for cross-references. UML 2 lifts the ban.

Figure PxM-30_8. Unable to overlap nodes in the deployment diagram (UML 1.4)

Illustration

The following diagrams show a possible use of it for the design of the system's geography.

Figure PxM-30 9. The types of sites represented by "nodes", in the UML sense



The types of sites

The figure above represents the types of sites as nodes of an architecture.

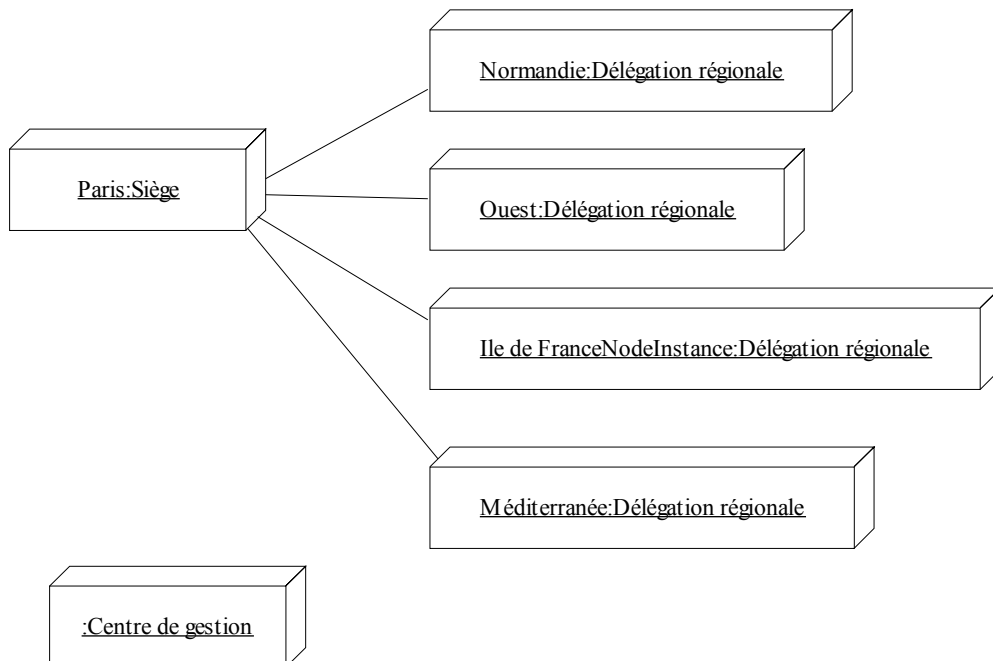
The links that connect these nodes can be added: doing so, we are generalizing the UML notion of a connection between nodes, in a computer system

The sites

The sites appear as instances of the types previously defined. They can be represented on a deployment diagram (as illustrated below)..

This example leaves hanging the question of the connection of the management centers and the departmental offices.

Figure PxM-30_10. The Sites representation



Communication

There are several available options. Communications can be established:

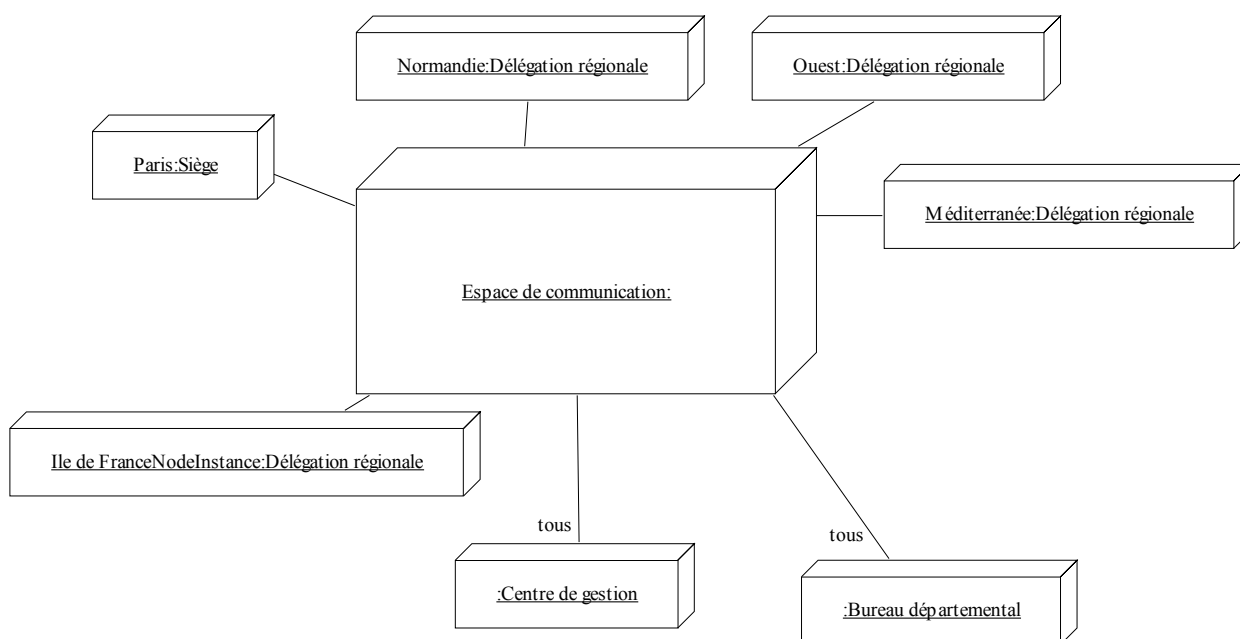
- Hierarchically (the office with its center; the center with its region);

- In a centralized manner (all the sites towards the head office)
- Universally (via a communication space, as shown in the last figure).

In the geographic model, the communication is not limited to computer networks. It also covers communication devices, such as shuttles, faxes, etc. These logistical possibilities have an impact on the progress of the procedures.

The Internet is associated *de facto* with the concept of a communication space.

Figure PxM-30 11. A geographic model illustrating a communication space



The contribution of UML: the collaboration diagram

The Context Diagram

Typically, one of the first representations laid down at the start of a project is the context diagram. It makes it possible to visualize the main entities of the system, along with the interchange between them and with the environment.

The context diagram is a special kind of data flow diagram (DFD); it is a first level DFD, in which the system is represented as a one piece.

UML 1.4 does not include a context diagram. However, the collaboration diagram can be diverted to that purpose.

The Collaboration diagram

The elements of the collaboration diagram are:

Objects, instances of classes;

Links between objects;

Messages.

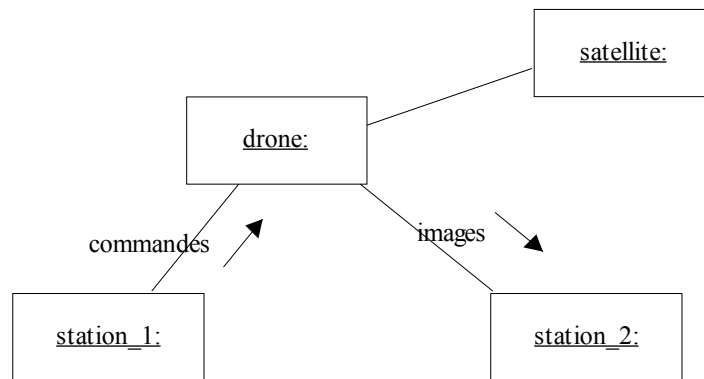
Thus, the collaboration diagram can be used to represent the sites of the system at hand or other physical systems with which it interacts.

The representation can first be informal: the objects are not associated with a class. It can later become formal when each object can be considered as an instance of a class included in the model.

**Non-formal
Representation**

The collaboration diagram is used to rough out the subject and formulate basic knowledge.

Figure PxM-30_12. A collaboration diagram illustrating the UAV system's geographic aspect



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