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FEATURE ORIENTED DATA ACQUISITION AS A SERVICE

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Background

GF is, by Swedish standards, a medium sized technical consultancy specalizing in planning and building design. GF Kartteknik is a subsidiary company for the surveying and cartography services. Cartography is in this way an integrated part of the consultancy. The cartography services therefore develop hand in hand with the other techniical services, with quick feedback. GF has thus become both cartographic producer and consumer. This has enabled us to collect information about user needs, even individual user needs.

The cartographic services provided, apart from basic mapping, are for example: topographic models as a basis for landscaping and road planning, town infrastructure registers, and basic survey material for CAD design and graphic display of pipe line systems.

As a by-product basic data is provided for perspective drawings and other illustration material for new buildings and developments in existing environments.

Another example of services provided is the mapping of existing industrial areas with all buildings, technical services, communications, in fact the whole infrastructure. The resulting data is transfered to the clients computers for further work in their individual CAD systems.

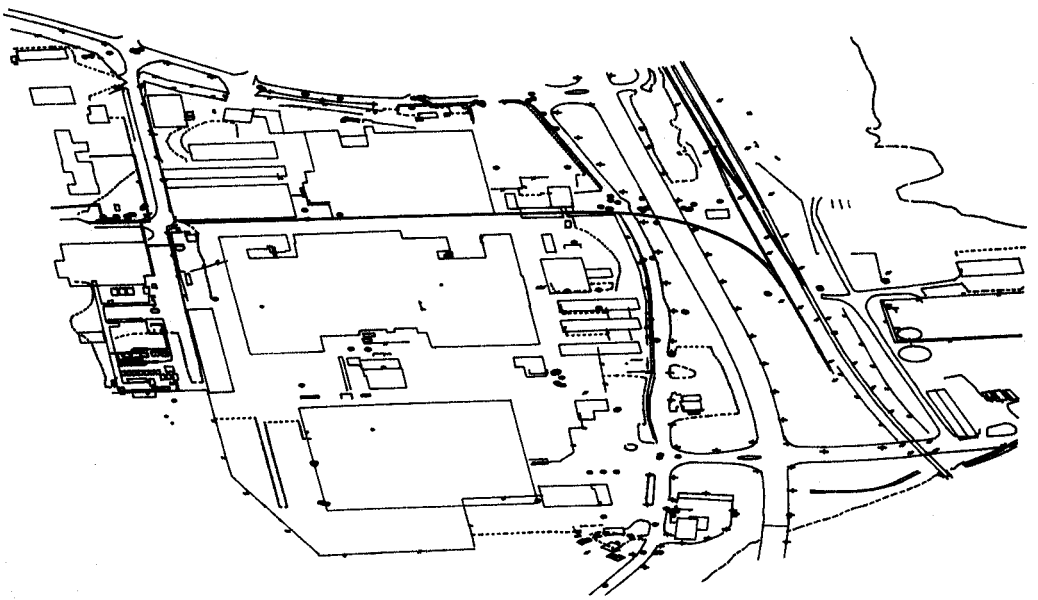

Figure 1 Example of industrial area where data is transfered from Phocus into an Auto-Cad system and from there a perspective drawing made out.

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Hard and software configuration

The Zeiss Phocus System with Workstation Planicomp P3, computer HP 1000-A700, videomap, editing terminals, graphical output Planitab T 110 etc was installed during august 1987. The system has been successively extended to its present configuration - see figure 2.

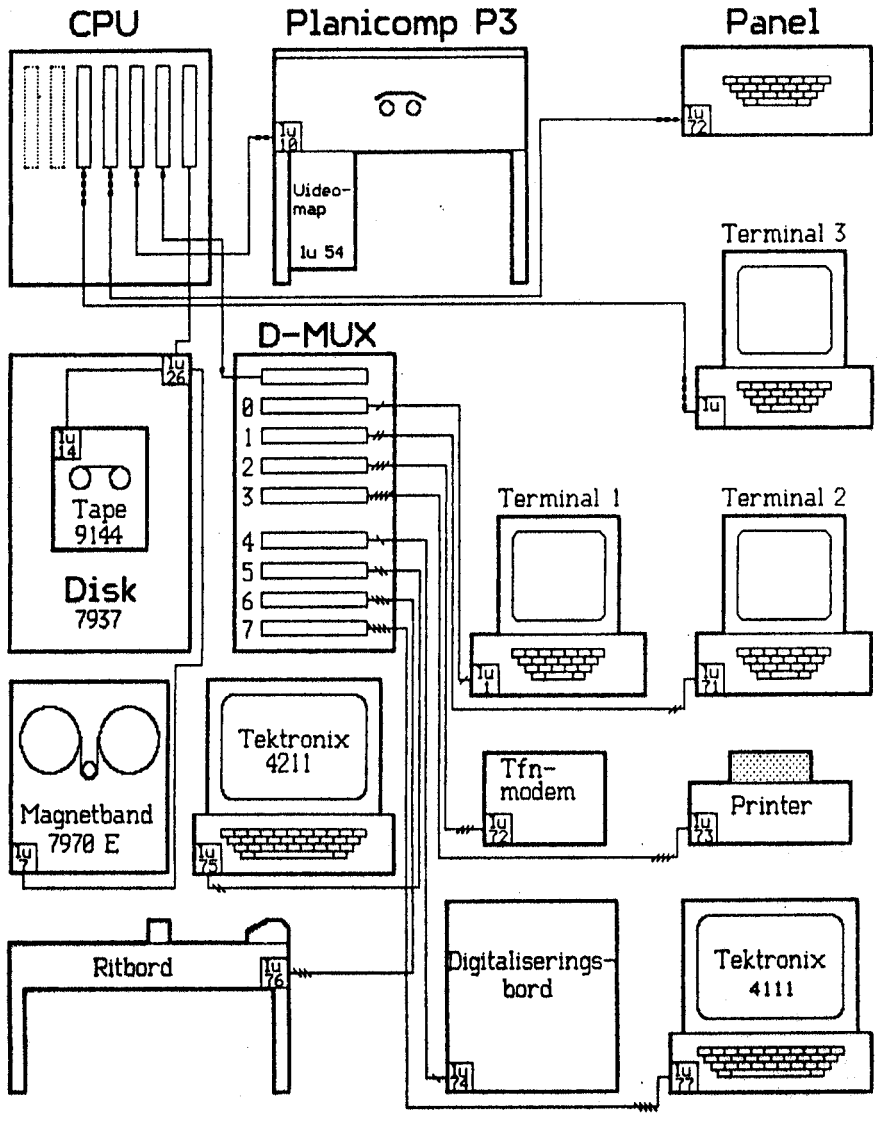

Figure 2 Configuration

Our system was newly developed and not commercially tested when it was installed. GF's equipment was the first to be installed in Sweden and the third worldwide. One must, of course, reckon with teething problems when newly developed equipment is first put to commercial use. Quite a long period of time was needed for internal training and development work before the equipment could be used commercially.

The problems that arose were mainly due to software shortcomings. A part of the problem was that the equipment worked successfully in laboratory conditions, but not so well in commercial usage when the data banks grew in size. Continuous changes and improvements were made during the autumn of 1987 and most of 1988. Today the system works extremely well.

Cartographic data bank

A well planned system for coding and transfering is required so that different users with other computer systems can use the data bank. A cartographic data bank, with object catalogue and transfering file for transmitting data, has been in operation in Sweden since 1983 (revised 1986). It is widely used by producers and users within the country.

The object catalogue has a structure consisting schematically of:

1 Title
2 Object class
3 Object
4 Item

A title can be refered to one of six title classes which represent different areas of application. For example, one title class is communication system where the structure is as follows:

0	Communication system	title class
1	Road communication	title
2	Motorway	object class
3	Slipway	object
4	Line	item

The object catalogue and code system are compiled so as to be flexible and easy to add to and develop. They are thereby usable more or less for all technical fields. It is possible to use them partially and with different levels of detail.

This great flexibility and more general development has been given priority with the result that the code system is not particularly user oriented.

A complete code with title, object class, object and item is comprised of up to seven characters.

Existing code systems for different technical branches have been taken into account during the development of the system. It is therefore possible to use the system for cartographic services and allied fields of work such as working drawings for buildings and landscaping. There is as yet, though, no existing object list for objects inside a building.

Phocus

The Phocus system has been developed in a similar way to the cartographic data bank described above. The level of detail and the coding system refer, in principle, to the following groups:

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- object class
- object
- object item
- attributes

A data base is created during data acquisition, where every object is coded by means of an Object Code Table (OCT). Acquisition can either be carried out graphically or by digitization. A Graphic Code Table (GCT) is required for graphic output. Every symbol is then constructed in a Symbol Construction Table (SCT). Each symbol is unscaled and can be constructed simply and effectively with the help of the editing or digitizing workstation with the DIGI programme.

The draughting parameters such as line thickness, size, text etc are chosen with the Symbol Execution Table (SET).

The OCT in Phocus comprises 256 object classes with the ability to code up to 32 000 objects and items. This means that the system is very flexible and can be put to general use. In practice only a small part of what is possible with the OCT will be used.

For example GF currently uses an OCT with 26 classes, 150 objects and 60 object items. Despite this, the OCT list contains over 400 lines because each object code is compiled in different ways from the specific code for class object and item. In this way the system is very easy to work with.

*	Class	0-code	I-code	Type	Name
0	30	10		LI	Street, road
			9	L1	Road reserve limit
			11	LI	Gate
			15	LI	Fence
			16	LI	Ditch
			17	LI	Hedge
			18	LI	Retaining wall
			19	PO	Lower railpole
			20	LI	Lower rail fence
			26	LO	Stone wall
			27	LI	Wide ditch
			28	LI	Direction arrow
			30	SL	Slope
			31	SL	Cutting
			14	SL	
			49	LI	Bruschwood
			50	LI	Roadside
			51	LI	Kerb
			52	LI	Refuge, island
			53	LI	Roadline under ground
			54	LI	Bridge abutment
			115	LI	Short fence
			117	LI	Short hedge
			710	LI	Stairs
			711	LI	Tread
			720	LI	Stair arrow
0	30	14		LI	Object to road
			11	LI	Gate
			15	LI	Fence
			16	LI	Ditch
			17	LI	Hedge
			105	LI	Brook < 0,25 m
			115	LI	Short fence
			117	LI	Short hedge
			18	LI	Retaining wall
			20	LI	Lower rail fence
			26	LI	Stone wall
			30	SL	Slope
			31	SL	Cutting
			50	LI	Roadside
			51	LI	Kerb

*	Class	0-code	I-code	Type	Name
0	11	4110		AR	Industry
			111	LI	House building <16 m²
			112	LI	Roof construction
			210	LI	Extension
			300	LI	Pent-roof
			411	LI	Pent-roof <16 m²
			412	LI	Pent-roof on foundation
			413	LI	Pent-roof on foundation <16 m²
			500	AR	Extension - rectangular
			510	AR	Pent-roof - rectangular
			710	LI	Stairs
			711	LI	Tread
			720	LI	Stair arrow
			725	LI	Pent-roof symbol
0	11	17110		AR	Living-house - photogrammetric
			112	LI	Roof construction
			210	LI	Extension
			300	LI	Pent-roof
			411	LI	Pent-roof <16 m²
			412	LI	Pent-roof on foundation
			413	LI	Pent-roof on foundation <16 m²
			500	AR	Extension - rectangular
			510	AR	Pent-roof - rectangular
			710	LI	Stairs
			711	LI	Tread
			720	LI	Stair arrow
			721	LI	Living-house symbol
			725	LI	Pent-roof symbol

Figure 3 Part of an OCT at GF. Notice that the same typ of item can appear at different object.

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As mentioned the coding is very general and object oriented. Even using only a part of the system's capabilities complete maps can be obtained. There is a great risk however that they wont be particularly flexible at the user stage. The data base, therefore, must be created so as to be user oriented, enabling automatic filtering, layering, scale changing etc without intermediate reediting and reworking.

A high level of detail in the build up of the OCT is required to make this possible. This takes time and requires understanding of how the data base will be used in the future and what demands different users may make.

Two months of continuous work was required at GF to create the OCT that is used today. It is still being added to as work proceeds.

Building heights and roof constructions have to be measured, for example, when data bases are created for perspective drawings. Here it is imperative that the snap function works faultlessly. This has been considerably developed in the P instrument since it was installed with us in 1987. GF's work has probably been a contributing factor to this development. Snap function is used here as meaning for example, snap to point, snap to line, snap to line without Z.

It is important when using digital cartographic data bases that transmission can be made between different systems. Our experience of the Phocus system is that transmission by transfering file can be done without any special difficulties to most other computer systems. Transmission of large data bases is however extremely time consuming.

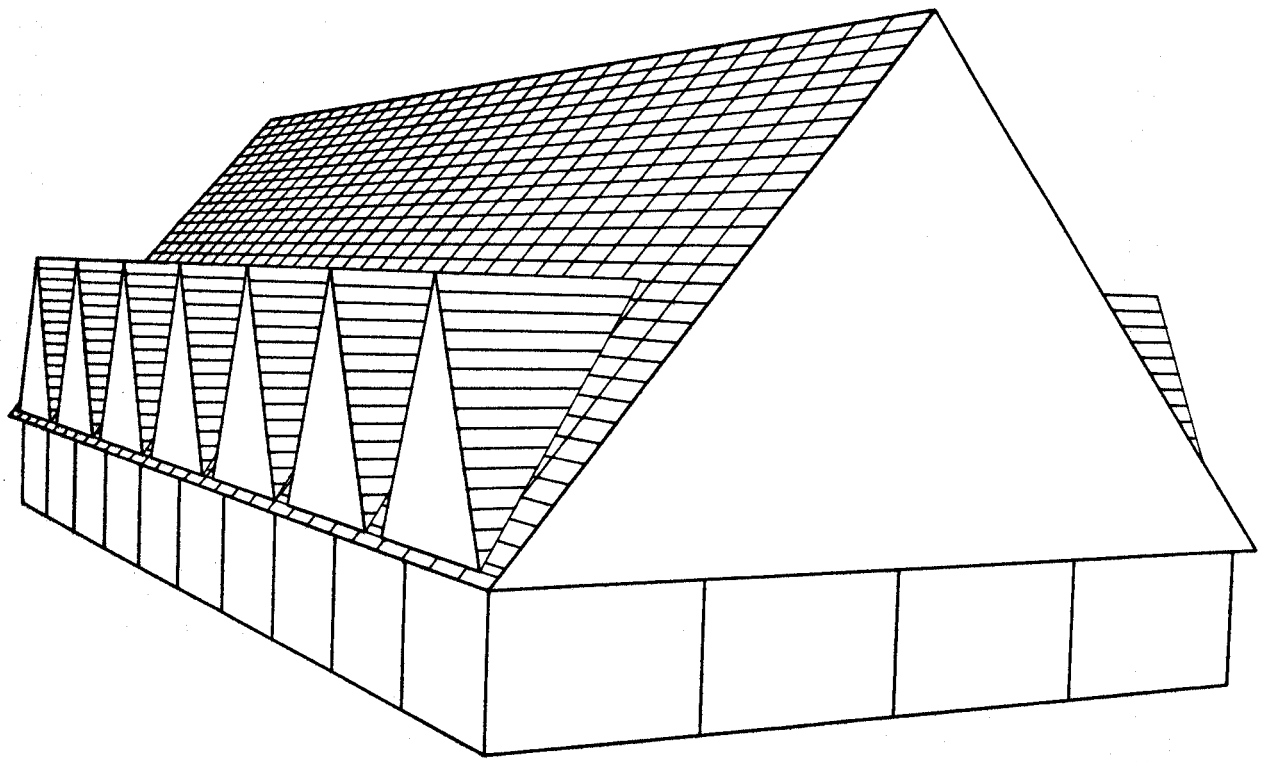

Figure 4 Data including roof constructions transfered from Phocus to Auto-CAD.

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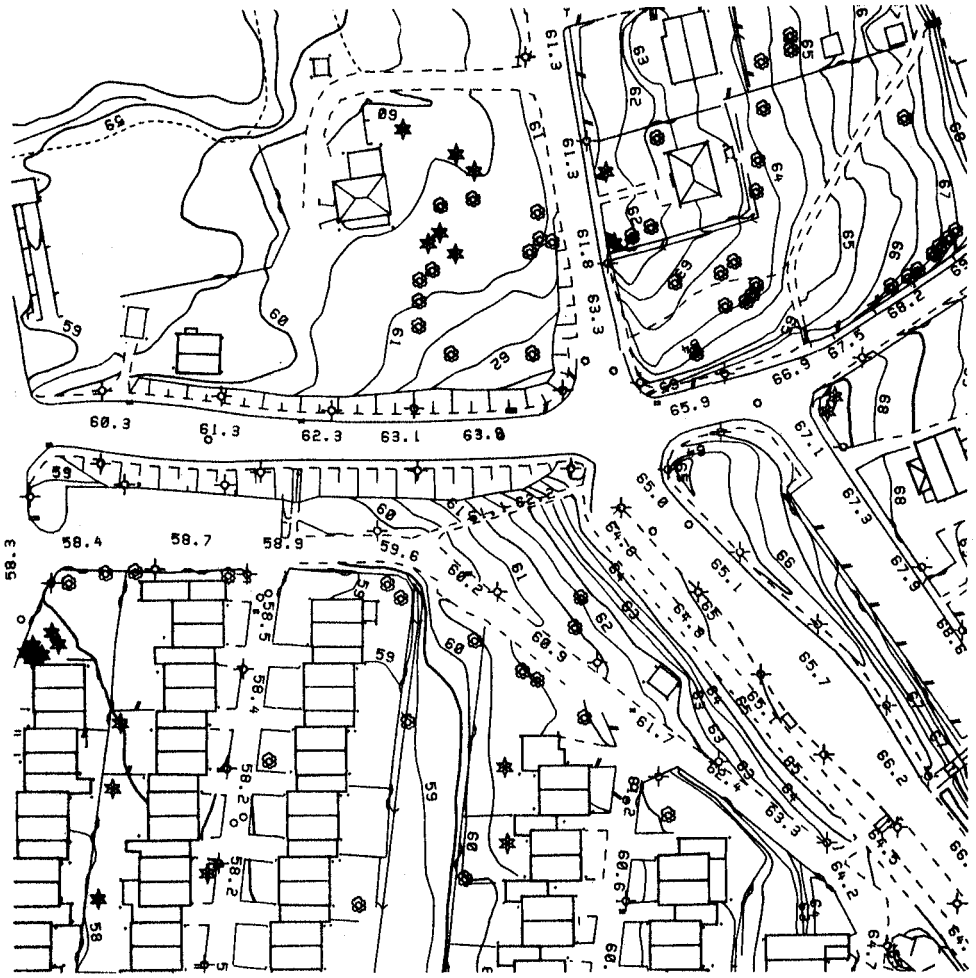

Figure 5 Map drawn from the complete data base.

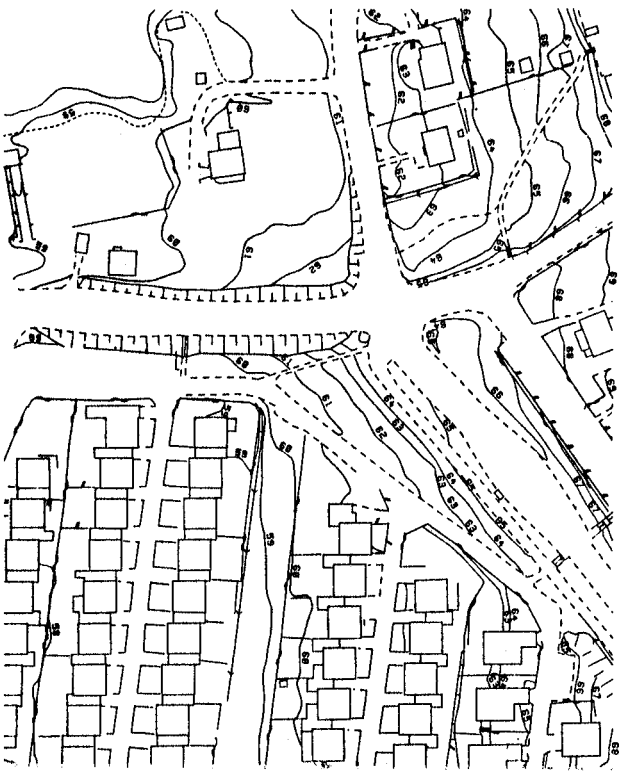

Figure 6

The same map as above drawn without reediting for another purpose. Example of selected objects are 0,5 m contour lines, several items belonging to the object road, single trees etc.

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Experience and advice

It is our opinion that one has to allow sufficient time for the making of a well arranged and sufficiently detailed OCT. One cannot just skim the surface and use too small a part of the system's capabilities. One has to put oneself in the role of the user and concider how the coding must be carried out so that the final result is as adaptable and flexible as possible. Even if cartography and data collection is carried out partly in sectors and with differing objectives, one has to bear in mind that in the future a single data base may be put to a number of different uses without reediting.

Reference

Svenska Kommunförbundet 1986, Kartdatabanken