Ninjo - A Meteorological Workstation of the Future

Introduction

The Deutscher Wetterdienst (DWD) together with the Bundeswehr Geoinformation Office (BGIO), Meteo-Swiss, the Danish Meteorological Institute (DMI) and the Meteorological Service of Canada (MSC) have together developed a new Meteorological Workstation. The first operational version NinJo 1.0 will be introduced in early 2005.

Figure 1: The NinJo Project team.

The main goal of the common NinJo-Project is to replace and improve the several existing workstation systems which have been used for years since the early nineties for interactive display of meteorological data, product generation, monitoring of observations/warnings as well as research and training (Kusch 1994, Koppert 1997, Heizenreder 1999).

Meteorological workstations have to provide an “easy to use environment” to support forecasting and warning activities in an operational environment as well as research and education. This was the task of the ageing systems and will be the task of NinJo as well. That is why NinJo has to provide most of the capability of existing systems, deal with recently developed applications and integrate new ones as they become accepted into the operational environment.

Forecasters have been integrated from the very beginning of the project, to ensure that all important requirements of the operational forecasting activities are known. Most of the forecasters of course, would like to stick to their well known forecasting tools. However, the goal of the NinJo-Project is to implement a new system that does (nearly) everything better than the ageing ones.

Since NinJo is a multi-national project with five partners (Members of the NinJo-Consortium), diverse hardware and software infrastructures, distributed development sites and local meteorological needs, a strong requirement is to build the software with a sound software architecture that could easily be adapted to the needs of the partners.

But it is not only the software architecture that influences the success of this international workstation project, it is also the management of the project. The management has to make sure that all requirements are incorporated, that resources are effectively used and the communication among the sub-projects is functioning effectively.

The NinJo Workstation

Requirements and specifications

User requirements were collected and structured at the very beginning of the project until August 2000. As a result, a high level requirement and specifications document was written at DWD (Heizenreder, 2000). These gathered requirements and specifications were the basis of the agreement between the five NinJo partners for the common NinJo project. During the course of the project, requirements and specifications were refined in more detail by all partners when the respective sub-project workpackages were initiated.

The following list shows NinJo's main features described in the requirement documents:
• Geographical data;
• Integrated 2D and 3D visualization:
- point data including: surface observations and soundings
- Lightning data;
- Gridded data;
- Satellite and radar imagery;
• Bulletins
• Batch production incl. maps, diagrams and products
• Data decoding and management
• Graphical editor
• Data modification - both point and gridded data
• Monitoring and alerting for observations and NWP data

For each of the features a detailed requirement specification is written, which then has to go through a review process. On the basis of the requirement specification, the software design is created and the software is finally implemented, tested and evaluated. This is the process for each NinJo release. So each new NinJo release comes up with improved features taking the latest test and evaluation results into account.

Introduction of the NinJo Features

The NinJo workstation works on the basis of a client server architecture. The forecaster works with the client computer and is faced with the NinJo main window there. The client gets the actual data from one of the running servers. Products such as forecast maps or meteorological objects are stored on dedicated servers and can be accessed from anywhere.

The main window on the client can be configured with several scenes (main scene at the center of the Screen and secondary scenes at the right border). Each of the scenes holds

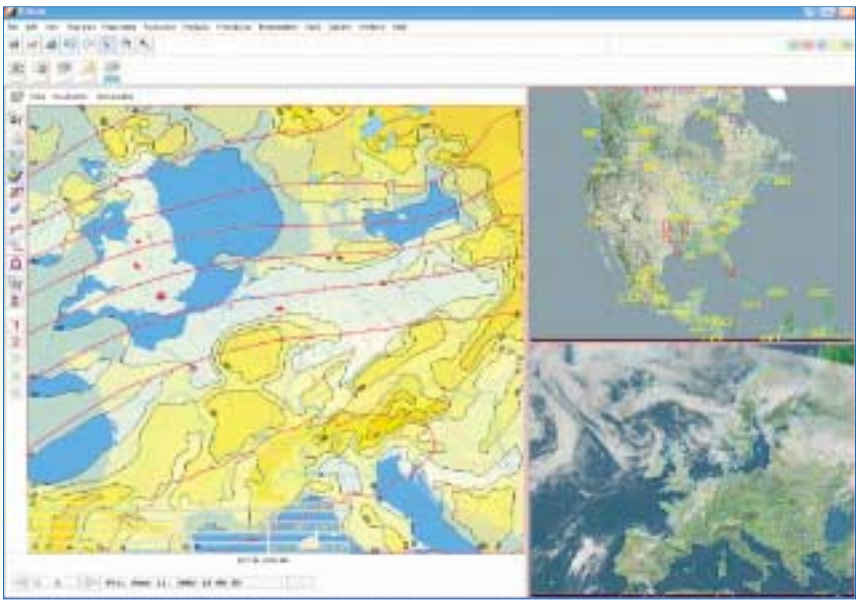

Figure 2: NinJo main window with 3 scenes, the main scene (gridded data at the centre) and 2 secondary scenes (surface observations - top right, satellite image - bottom right)

several layers, where each layer is responsible for one kind of data (model, radar, satellite ...). Additionally to the main window, there are several secondary windows holding sounding displays, meteograms, text editors etc.

The described window structure was accepted by the users at the very beginning of the project as the best compromise between static windows such as DWD's old legacy software MAP and extensive multi- window systems.

The user can combine all available data using several layers of the NinJo layer framework within the scenes of the main window. Each layer has its own layer button, which allows the user to switch on/ off the visualization of the layer or to choose the data of the layer as well as the appropriate graphical attributes. At the left site of the main window a layer specific toolbar appears for the chosen layer.

Here the user finds buttons to reach functionalities often used.

There are 2 layers used nearly in all scenes: The "geovector layer" and the "georaster layer". Using these layers the user can visualize rivers, towns, streets (geovector layer) or mountains, land use, etc. (georaster layer).

NinJo allows the integration of nearly all types of geographical information such as the Landsat image (Figure 3) showing parts of southern Germany with a maximum horizontal resolution of 50 m.

On top of the geographical data, model data or observational data are normally visualized.

NinJo will also come up with a graphical editor to create graphical meteorological objects such as

Figure 3: Landsat Image for the georaster layer with 50 m resolution.

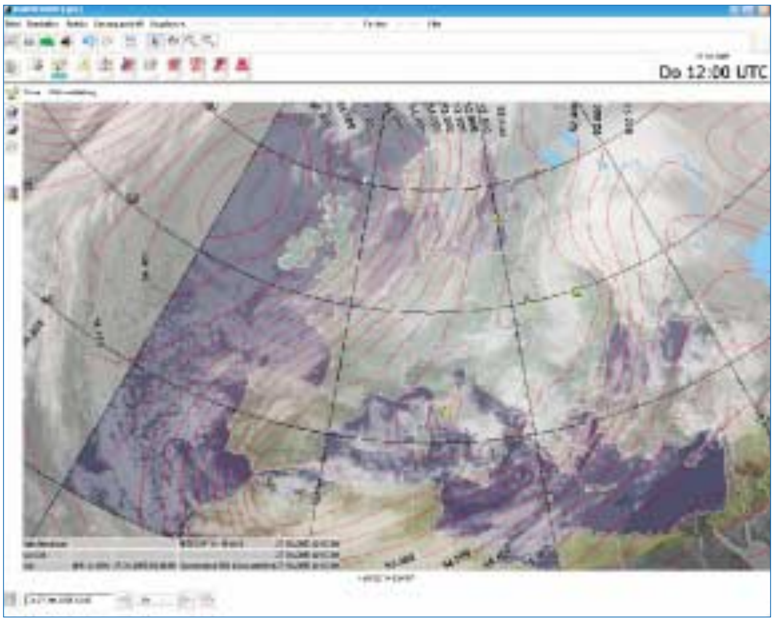

Figure 4: NinJo main window configured with only one scene. Geographical data, satellite data, model data

Figure 5: NinJo main window configured with only one scene. Geographical data, surface pressure, satellite data and meteorological objects are created with the graphical editor functionality of NinJo

fronts, weather areas etc. An on screen analysis is under development.

The Automatic Monitoring and Alerting system (AutoMon) of the NinJo is able to permanently monitor configured significant weather situations in observational data and model forecasts. It alerts the forecaster when configured thresholds are exceeded.

Synthetic satellite images will be generated for AutoMon to identify differences between observational data (satellite images) and model data.

The radar layer within NinJo will enable the forecaster to inspect not only the composite images but also the details of the cell detection algorithm used (numeric information provided with tables) and the single cell views to get information about the actual status of the convective systems monitored.

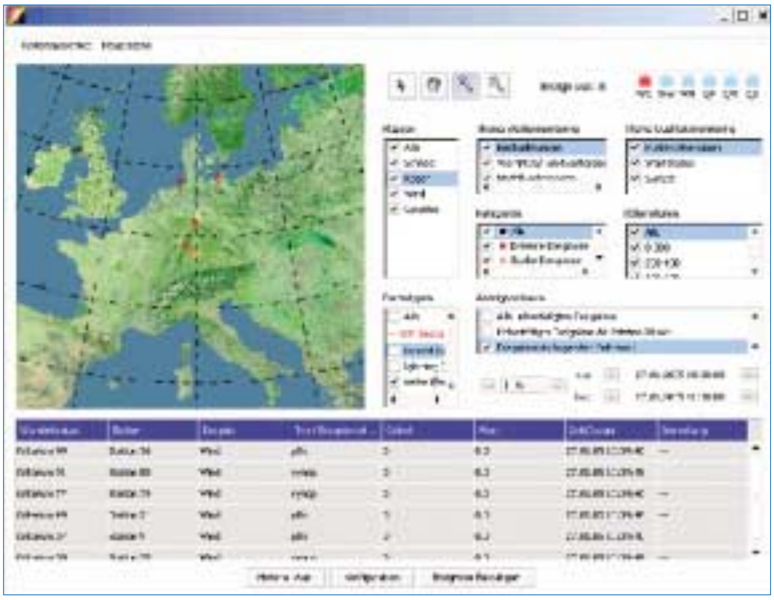

Figure 6: AutoMon window of NinJo

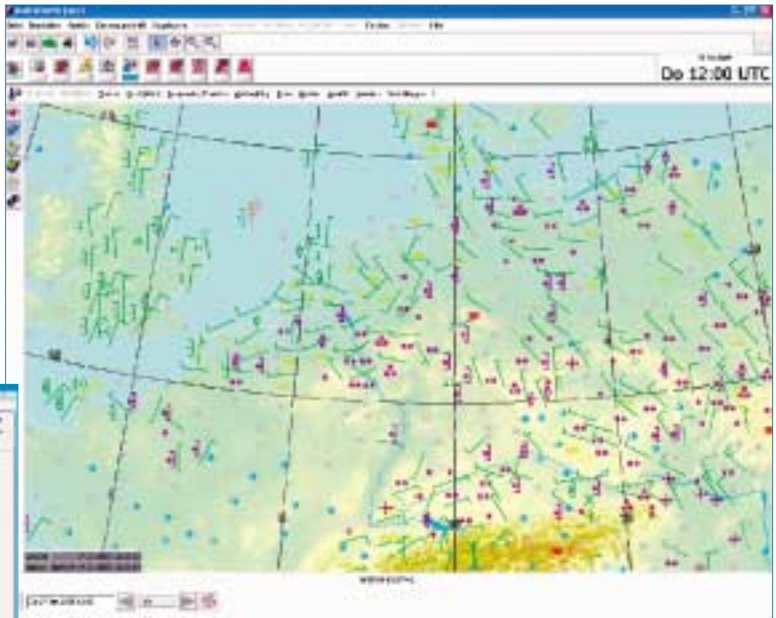

Figure 7: NinJo main window configured with one scene. Geographical data, observational data

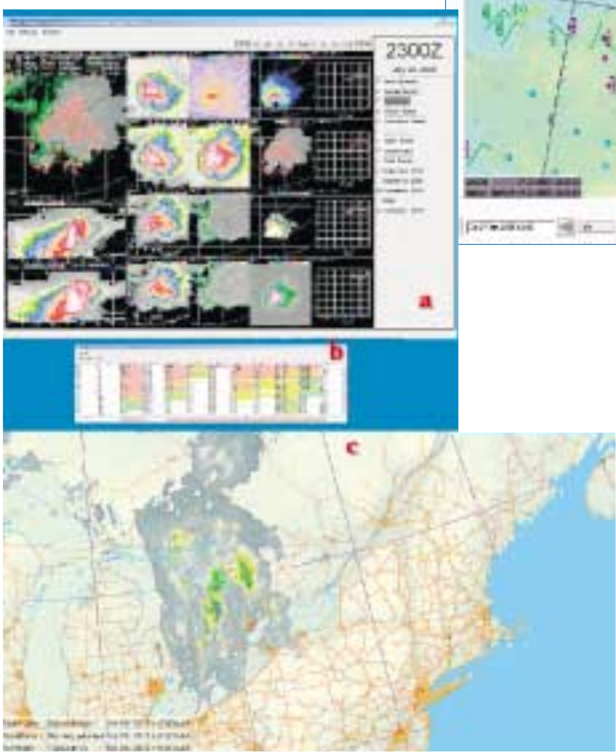

Figure 8: Radar data, Cell detection, Single Cell view – Components of the planned NinJo Radar Layer.

The NinJo Project Management

With so many diverse partners associated with good meteorological knowledge and software development practices - requirement gathering, documentation, user testing, project planning, estimation, scheduling, reviews, evaluations - have to be in place.

Requirements are gathered amongst the consortium members and the work is assigned to individual teams. This allows access to a much larger pool of expertise and a much better critical review of the software. A big advantage of working within an international consortium is that petty issues (that can bog down a project) disappear and national pride provides incredible motivation. There is very strong commitment and support at all managerial levels within each organization for the project – often a key success factor.

The Project organization

The most important project body is the **Steering Commitee**. It is responsible for the assignment of resources and the prioritization of tasks, planning, budget and risk management. Every partner appoints one member to protect the partners' interests.

The **Project Manager**, Hans-Joachim Koppert, completes the Steering Commitee. He pulls the strings within the whole project, organizes the necessary work and controls the work of the software design, developer and architecture teams. His project office is located in Offenbach.

Although a lot of the Danish partners understand German, the project has switched the working language from German to English after DMI joined the project. This was "very much appreciated" by the MSC. The addition of the MSC created additional issues – distance, travel and time differences. With telephone, email and telecommunication networks, the distance and time is not such a hindrance. Such a substantial project would not have been contemplated 10 years ago before the advent of email and the internet. In fact, the 6+ hours of time difference promotes better planning and better communication as one tries to prevent emergencies.

Eight distributed **Developer Teams** and an additional **Software Design Team** are responsible for the development of all software packages. Each of the team has his own task, different from the other teams. The segmentation of the resources is the source of the project power.

The work packages are concentrated to single sites. The Berlin site is responsible for the software design and the software architecture, as well as the Graphical User Interface. The radar layer and the graphical editor is handled in Toronto, diagrams are programmed in Copenhagen, geographical data are handled by the Bundeswehr Geoinformation Office (BGIO) in Traben-Trabach. Offenbach is responsible for the satellite data, Zurich handles the data server and cross sections. This distribution of work packages is analogous to good software practices – interfaces are clear and well defined.

There is only one team that consists of members from all partners - the Software Design team. The team meets regularly to discuss software design issues in order to be able to integrate all requests from the partners. The chief designer, Sybille Haucke from the Berlin site, makes sure that there are no diverging design concepts. The software design principle, the separation of basic infrastructure components (framework) and specific applications (layers), makes software development "across the Atlantic" possible.

The Integration of the User

The user (forecaster, researcher) is the ultimate judge of NinJo's success. Users have been integrated from the very beginning of the project. They helped formulate the requirement specifications and are integrated in the refinement phase of the respective work packages when we deal with GUI-components.

A very important NinJo project body is the **Evaluation Group**. It consists of forecasters and researchers of all partners and gives an immediate feedback to the developer teams concerning the latest NinJo release. The fruitful exchange of ideas within this group helps to identify bugs and problems within the software and helps to enhance the functionality of the system. Found problems and specifications of new features are discussed together with main members of the development team and the project management team during regular evaluation workshops, right after the latest NinJo release. During the evaluation workshops, forecasters often indicate the need to have quick access to their use cases without too much clicking – NinJo has improved the User Interface with each version and the most important use cases are now only one click away. Through the evaluation team, forecasters have recognized that they are an important part of the development process and that their contributions make NinJo an even better tool.

The members of the Evaluation Group are appointed by the **User Group** which finally reports results and decisions of the evaluation process to the Steering Committee.

Status of the NinJo project

NinJo 1.0 will be introduced operationally in 2005. NinJo 0.9, which is the most recently evaluated version, features most of the required data types and servers.

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