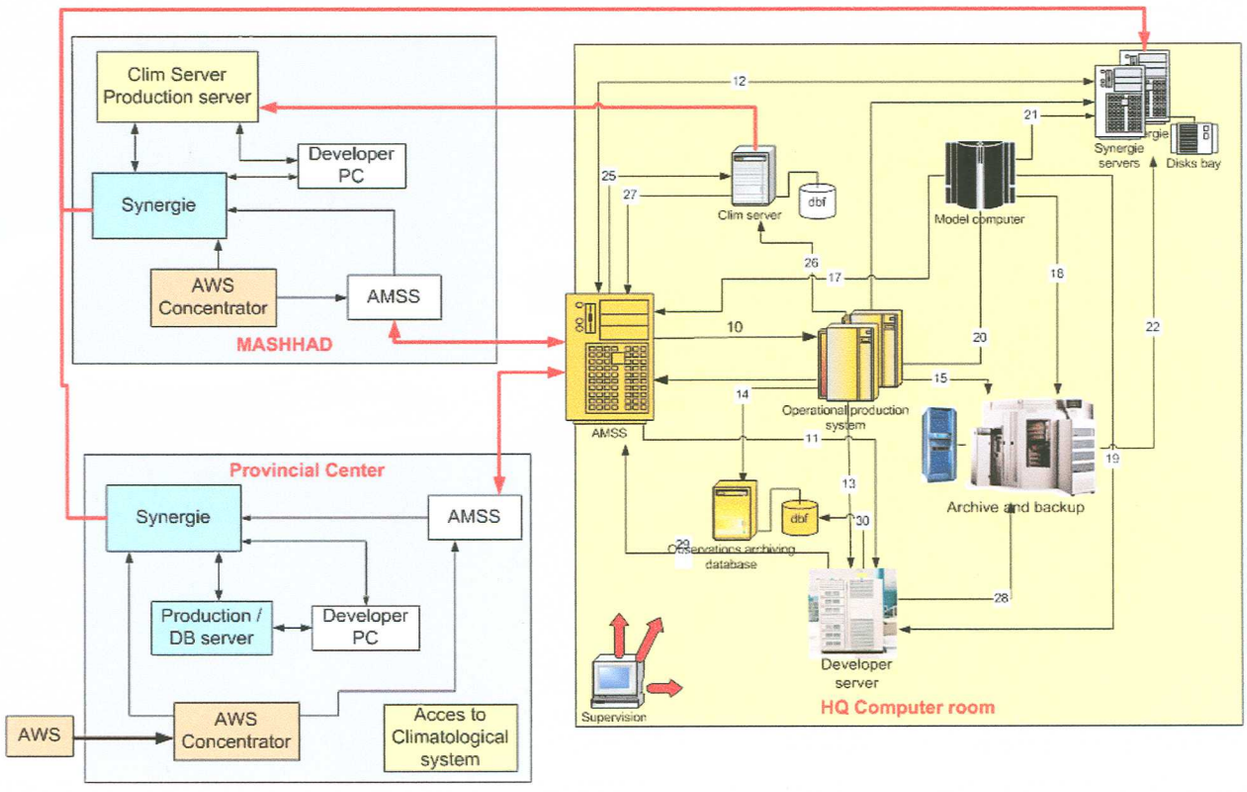

National Information System

Main Principles	The main principle is to rely on reliable systems and single system administration team. Choice has been made of Linux operating system that has proved to be very reliable in time and fitted to critical real time applications such as meteorology. Single administration team enable compact organization and efficiency, enabling users, researchers or developers to concentrate on their core activity. **Headquarters**: IRIMO intends to gather all main facilities in computing, data processing, archiving and telecommunication in a single place (computer hall). All systems will be connected to the central AMSS (which should be upgraded, cf §4.3.1). **Provincial level:** The information system at this level should be much lighter (in size and number of systems) and allow mainly data concentration, local management and production. The implementation of all subsystems will come in an early step of the Project (beginning of Phase 1) to allow easy connexion of all coming observation, telecom, data processing subsystems.

	Significant upgrade could be brought to the high power system in Phase 2 in order to run the models over a wider area and serve the surrounding countries in NWP products (see also §4.3.1 telecom)	
General design	**Central Information system** The data management at IRIMO will be designed in a homogeneous and non redundant way. It relies on proved solutions that are operating at Meteo-France, with adaptations to the Iranian context. Data management covers real time data, climate data, and archive. Regarding hardware to be implemented in the computer hall : in addition to AMSS, Synergie and TV-Met servers (dealt with in §4.3.1, §4.4.1, and §4.5 respectively), the hall will contain: - *High computing system* (based on cluster technology) dedicated to model operation (atmospheric, sea state and pollution) as soon as technical teams are trained by Meteo-France on the scientific aspects. In the meantime, models can be run on Meteo-France supercomputer for immediate and tangible improvement of available simulated data at IRIMO. - *Climatological server*: the server will host all climate data managed by IRIMO, and will be fed in real time or near real time from data coming from the surface and upper air observation network. (see §4.4.2); similar configuration to be implemented at Mashhad NCRI. - *Archiving and back-up system* : This system is very much complementary to the climatological server, as it manages other types of data, such as foreign observations, numerical model runs, radar and satellite pictures according to an archiving policy that IRIMO and Consultant will agree on. The system will also allow the back-up function for all critical systems at IRIMO HQ. - *Central Production server* : this server (with full real time back-up) will operate all operational production tasks that requires scheduling, supervision, and input data from other systems or other tasks. New tasks to be implemented on this server only after validation on the ... - *Development server.* All systems will be administrated, and supervised on a 24h basis.	
Quantities*	**Headquarters** **High computing system (cluster based)** **High computing system (upgrade Phase 2)** **Climatological server (HQ)** **Archiving system** **Central Production Server** **Development server**	 **1** **1** **1** **1** **1 (+ back-up)** **1**
	Provinces **Province server (Data base + development)**	 **28**
***(indicative values only ; see detailed scope of supply)**	**Other centres** **Climatological server (Mashhad)**	 **1**

Forecasting & warnings

Main Principles	IRIMO is in the process to reorganise the whole Forecasting function. The main idea is to provide the users of all categories in a timely manner with accurate forecasts, warnings or products. A customer driven approach is necessary, leading to determination of the ideal run time of the national NWP model. At national level, IRIMO will organise general forecasting between Central Forecasting Office (CFO) at HQ and provincial centres (PC) acting complementarily. CFO will issue guidance and coordinate nationwide production from contributions from provinces. A major production is nation-wide warnings to populations and authorities. Night shifts could be set up in some provincial centres to ensure permanent weather watch at regional scale, in full consistency with the upgraded round-the-clock observation network. IRIMO will also organise specialized forecasting, including aviation and marine meteorology. To this end, CFO will rely on specialized centres among the Provincial centres. The forecasting activity will also interface efficiently to the end-user production, through data base systems available at CFO and PCs, and specific and web-based production systems. Such design enables forecasters to focus on meteorology and weather and automatic or assisted system to deal with more massive production, with tailored presentation or content. (*see §4.5*) All systems are to be implemented in CFO and all provincial centres, according to existing IRIMO organisation. Possibility is left to have major provincial centres (for instance in charge of night weather watch or specialized meteorology), with specific configuration and role in the national process. Forecasting and visualisation Systems will also be implemented in the RMTC in Tehran for real time access to data, easier explanation of new concepts in meteorology, and efficient training of operational forecasters, speeding up the technology and know-how transfer aimed by IRIMO. It is expected that all forecasting systems are being deployed within the first Phase of the MITD project.	
General design	After IRIMO finalizes forecasting organisation, the forecasting workstations will be configured in a way to fit the defined organization. The proposed systems (SYNERGIE) rely on a server / client architecture, with servers directly connected to the central or Provincial Information System, and clients implemented in the forecasting rooms. All clients are dual or triple display and include a web based editor for easier warning management and interfacing to end-user production system. They include all necessary features in data visualisation, interaction, investigation, and expertise production (Significant weather charts, guidance and text bulletins).	
Quantities*	**HQ main servers** **HQ forecasters workstations + back-up/study**	**2** **6**

**(indicative values only ; see detailed scope of supply)*	**HQ non operational workstations** **Provincial centres x 2 standalone positions** **RMTC training room (4 training positions)** **SYNERGIE licence (national)**	**tbd** **28x2=56** **1** **1**
	Early Warning organization	**included**

Climatology

Main Principles	The main purpose of the new climate data management system is to provide IRIMO with a powerful data base system, enabling easy *management, quality control, and efficient production.* The principle is to have a centralized operation of this main function, with a national data base at HQ, fed in near real-time with data from the whole network (airports, upper air, synoptic, climatological, ...). Centralized data will help to keep homogeneity to operation and quality control, together with a better efficiency in product development. Metadata will be managed as well, all along the life cycle of the observing network. Automized administration of the data base will result in more qualified jobs and development of new services to customers. Open web-based production environment will be made available to IRIMO climatologists. Although system in HQ will host the reference national climate database, Mashhad national Centre (NCRI) will be equipped with a mirror copy of the national database, with fitted update mode from HQ, enabling full data processing and ambitious studies there. Provincial centres will contribute to national database and will also have access to the data base through telecommunication means : they will be in position to deal with local customers or state users, and develop new capabilities in local/regional studies. IRIMO will have full control on data structure and development on top the data base. The climatatological data management system will be implemented in an early stage of Phase 1.
General design	Main data server is part of the central Information System. As such, it is connected through the LAN to the rest of the Information system. The system administration, the operation incl. quality control, and the use (for study or production purposes) are separate, which allow clear separation of responsibilities.

Quantities* **(indicative values only ; see detailed scope of supply)*	**CLISYS full licence incl. Quality control (HQ)** **CLISYS licence (Mashhad NCRI)** **Data entry software (provinces)** **Rehabilitation of the whole existing climate archive**	**1** **1** **<** **1**	**28**

	archive	

End-user production

End-user production will encompass Public Weather Services (TV, news papers, radio, GSM) and web-based production to end-users or specific users (civil security, agriculture, oil industry, ...)

Main Principles	**Public Weather services** : The Project addresses mainly the PWS issues at national level. PWS development will be achieved through deep integration within the central Information system, in order to get all relevant data and products available to the PWS systems. Regarding services to TV, IRIMO will have the full capability available both at CFO (for bulletin preparation from raw data up to video signal) and at TV channels (for presentation and real time interaction with the signal). Special place in the Forecasting room will be devoted to this activity. IRIMO will implement at least 2 working positions at CFO. The TV presentation system will be also used for services to newspaper and inclusion in the IRIMO web site. Lighter configuration could also be envisaged at major provincial centres. **Web-based production** Developing a full service capability is very much complementary to the modernization of the Forecasting function. But dealing with increased users from different categories with limited staff makes necessary to split between expertise work (to be devoted to forecasters at HQ and provincial centres) and product supervision work. Product derivation must therefore be semi or fully automatized in order to serve an increasing community of users. The web based solutions will be used as they are more and more popular and intuitive and also because of the good performance of this kind of techniques in Iran. Invoicing specific categories of customers is not included in the technical solution, as it does not fit the IRIMO guidelines, but should be made possible with very low efforts. The human intervention in end-users production should be limited to a strict minimum and is generally a question of tailorization / presentation, and not any more a matter of science and meteorology. Therefore, it is suggested to redeploy assistant forecasters to such working positions. The purpose of end-user production is to integrate the maximum amount of data sources (radar, satellite, observations, forecast texts & warnings, ...) from the central data management system, to derive in a mostly automatic way fitted products from those data and disseminate them efficiently through web sites, newspapers, dedicated displays, ..., on different formats. End user production system should be finalized I Phase 1, as well as part

	of lighter production systems in main provinces. The remaining provincial production systems will be deployed in Phase 2.	
General design	**The TV-MET system** is based on 3 modules : - the TV-MET Admin module interfaces with the Information systems and deal with all relevant products and data types - the TV-MET Builder may be implemented in dedicated working positions for bulletin preparation (for one TV channel) - The TV-MET Play-only module is implemented at TV channel premises and is used by the presenter in real time **The end-user production system** relies on : - *a web based editor* integrated in the forecaster workstations enabling texts or data edition for further use by production system - *a server* hosting the above mentioned texts and data edited by the forecasters - *production tools* enabling the presentation & formatting of products (text, pictures) generated from other IRIMO subsystems, for further inclusion in web sites, newspapers, mobile phones,... - *dissemination tools* relying on ftp enabling tailored product service toward identified (paying or not) customers - *a web based application* for users willing to get a real time look to the data and products from IRIMO The system architecture is open, enabling easy adaptation to new data, products, or emerging customer needs.	
Quantities* ***(indicative values only ; see detailed scope of supply)**	**TV-MET Admin at HQ (server)** **TV-MET Builder at HQ (clients)** **TV-MET Play-only at TV premises** **End-user web based production (HQ)** **Upgrade of the IRIMO web site** **Simplified production system at Provinces**	**1 (+ back-up)** **2** **3** **1** **1** **<28**

Research : About cooperation agreement between IRIMO and Météo-France:

Numerical Weather Prediction and Marine Models are Project components that are very tightly related to the cooperation agreement signed between Meteo-France and IRIMO on Oct.13th, 2003 in Paris. Such agreement mentions about a clear technology transfer and training towards selected scientists from IRIMO.

Nevertheless, in MITD Project, it is a question of setting up an **operational capability** in both domains, in parallel to the above mentioned technology transfer.

Hence it is suggested to have a clear separation between research activities (mainly led within the cooperation agreement) and the model operation on a daily basis (mainly led with the support of the Information System and the specifications from the Forecasting Department). Setting up the computing capability, enabling daily run at fix time from given boundary conditions, post-processing the data for forecasting systems in a timely manner, give IRIMO and the country an immediate added value through high resolution atmospheric and sea state modelling: this is all about the content of the next components of the MITD project.

Numerical Weather Prediction

Main Principles	It is assumed that IRIMO will appoint a NWP team in charge of research work and participating to the ALADIN club as agreed in the MoU with Meteo-France. From this starting point, IRIMO will then decide on the exact location of research work (which also needs computing and data environment), given that the existing locations (Tehran, AMERSC, Mashhad) may not be optimal for this purpose. Depending on decision from IRIMO, 1 or 2 sites will be equipped with working capabilities and high speed connexion to Computer Hall in HQ, in order to have ability to launch runs from their research centre (during non critical time of the day) and get corresponding output. Before any high power system is available and operating at HQ, the ALADIN model will be run on a daily basis on the Meteo-France supercomputer and results be made available to IRIMO through telecommunication means (see §4.3.1). It is expected that the transition period will end before the end of Phase 1. Then, as soon as a team mixing IT specialists, forecasters and NWP people is ready to handle operational runs on a daily (365days/year) basis, the main computer will be implemented and will host the ALADIN configuration. Contractual relations will be set up between NWP and forecasting department
General design	ALADIN is the meso-scale model developed by Meteo-France and its partners (about 15 countries in 2003). It is used in operation in many configurations ranging from tropical to cold climates, and on a wide range of computing platforms (from PC to Supercomputer through clusters). ALADIN uses the boundary conditions from ARPEGE global model developed by Meteo-France in cooperation with the ECMWF. Main characteristics are 30 to 41 vertical levels, and a horizontal resolution which can be set from 5 to 35 Km depending on geographical domain, available computing power, and available computing time. In the case of Iran and due to the size of the country, it is proposed to start with an initial configuration with max. horizontal resolution of 15-25Km, and aimed number of levels of 41, with full ability to upgrade those figures when computing power increases. The geographical domain will also vary from an "Iranian" domain at the start of the Project to a more regional domain encompassing surrounding countries in Phase 2. The domain of interest should also be consistent with the need from wave models. The computing power is expected to allow forecast and post-processing in a reasonable elapsed time. The geographical position of Iran in respect to Greenwich meridian makes necessary to have the main model run on the basis of a 12.UTC or 18.UTC boundary conditions, which could leave some additional time to run the model before the forecasters really need the output. Possible upgrade in Phase 2 also include a nested domain (e.g. Tehran

	region) which could have the model run at higher resolution (e.g. 10km).	
Quantities* *(indicative values only ; see detailed scope of supply)	Working environment for research team ALADIN runs from Tlse during transition phase MOCAGE runs from Toulouse (transition) Implementation of the ALADIN Iran configuration Implementation of the ALADIN larger conf.	1 (or 2), tbc 18-24 months 18-24 months 1 1

Oceanography and sea pollution

Main Principles	It is assumed that IRIMO will appoint a Marine team (from OASC) in charge of research work and cooperating with the MF Marine Department on sea state model (VAG) and on oil pollution model (MOTHY) as agreed in the MoU with Meteo-France. OASC will be equipped with working capabilities and high speed connexion to Computer Hall in HQ, in order to have ability to launch runs from their research centre (during non critical time of the day) and get and process corresponding output locally. Before any high power system is available and operating at HQ, the VAG model will be run on a daily basis on the Meteo-France supercomputer and results be made available to IRIMO through telecommunication means (see §4.3.1) Then, as soon as a team mixing IT specialists and NWP people is ready to handle operational runs on a daily (365days/year) basis, the main computer will be implemented and will host the first VAG configuration (e.g. Caspian Sea). The other basins (Persian Gulf and Oman Sea) should require light assistance only. Regarding the MOTHY model, which is not to be used in a regular basis normally, it will be launched at MF premises on request from IRIMO until IRIMO develop its own capability for running the model, with a similar approach as for the sea state model.
General design	VAG is the seastate model developed by Meteo-France. It is used in operation in many configurations ranging from global to local basins, close seas, or regional areas; it is suitable to a wide range of computing platforms (from PC to Supercomputer through clusters). VAG uses the boundary conditions (surface wind) from ARPEGE global model or ALADIN limited area model. In the case of Iran and due to the specificity of the country (3 basins), a step by step approach is suggested : it is proposed to start with an initial configuration on a first basin (e.g Persian Gulf), and generalize to Caspian Sea and Oman Sea in a latter stage. A similar approach will be sought for the oil spill dispersion model (MOTHY). VAG and MOTHY will be run on the same computing platform as the

	ALADIN model, enabling easier system administration and task scheduling.	
Quantities* *(indicative values only ; see detailed scope of supply)	Working environment for research team (OASC) VAG runs from Tlse during transition phase MOTHY runs on request during transition ph. Implementation of the VAG Caspian Implementation (help) of the VAG Persian Gulf Implementation (help) of the VAG Oman Sea Implementation of the MOTHY Caspian Implementation (help) of the MOTHY Persian G.	1 (or 2), tbc 18-24 months 24-36 months 1 1 1 1 1

Environmental Prediction

Main Principles	It is assumed that IRIMO will appoint a research team in charge of research work and participating to the cooperation work on environmental modelling as agreed in the MoU with Meteo-France. Cooperation on such field will start some time after cooperation on, other topics. Most of cooperation and implementation work should be achieved in the second phase of MITD project. It is aimed to implement an Iranian configuration of the so-called MOCAGE model, able to simulate and predict pollution concentration over the country from output of ALADIN Iran model, MOCAGE-Globe model, and also from the mapping of pollution sources available over Iran (from EPA). The MOCAGE-Iran model will be first run on a daily basis on the Meteo-France supercomputer and results be made available to IRIMO through telecommunication means (see §4.3.1). It is expected that the transition period will be much shorter than for ALADIN. Then, as soon as a team mixing IT specialists, forecasters and NWP people is ready to handle operational runs on a daily (365days/year) basis, the main computer will be implemented and will host the MOCAGE-Iran configuration. Model will run on the same Cluster of PC as for ALADIN, out of the peak hours.
General design	MOCAGE is the universal pollution model developed by Meteo-France. It is used in operation. MOCAGE-Iran would use the boundary conditions from MOCAGE global model, and from ALADIN-Iran running at IRIMO HQ. Main characteristics are 47 vertical levels (most of them in the stratosphere for reasons linked to chemical equations), and a horizontal resolution which can be set from 5 to 35 Km depending on geographical domain, available computing power, and available computing time. In the case of Iran and for efficiency reasons, it is proposed to start with an initial configuration with same resolution as for ALADIN (same grid), with full ability to upgrade it if/when computing power increases.

	The computing power is expected to allow forecast and post-processing in a reasonable but non critical elapsed time. IRIMO will have to concentrate on gathering all relevant information about mapping of pollution sources throughout the country to have them available as forcing conditions to MOCAGE.	
Quantities* **(indicative values only ; see detailed scope of supply)*	Working environment for research team ALADIN runs from Tlse during transition phase MOCAGE runs from Toulouse (transition) Implementation of the ALADIN Iran configuration Implementation of the ALADIN larger conf.	1 (or 2), tbc 18-24 months 18-24 months 1 1