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RMDCN – Next Generation
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RMDCN – Next Generation

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The Regional Meteorological Data Communication Network (RMDCN) is currently undergoing modernisation in order to meet the future requirements of ECMWF's Member States and the wider meteorological community. A recent procurement exercise identified that these requirements could be met most cost-effectively by migrating to a new state-of-the-art network operated by a new service provider – Interoute Communications Limited. This article describes the work that has been done, particularly over the last year, and the migration plans for the coming 12 to 15 months.

Background

During the 1990s Regional Association VI (RA VI) of the World Meteorological Organization (WMO) started a project to investigate the possibilities of using a Managed Data Communication Network for the provision of the Global Telecommunication System (GTS) in their region. With ECMWF participation this resulted in the creation of the RMDCN. Following an open procurement in 1998 the RMDCN started its operational service in March 2000 with 31 sites participating. The original service provider was Equant UK Ltd, which subsequently merged with Orange and France Telecom to create Orange Business Services (OBS).

The RMDCN provides a network infrastructure for the connections between ECMWF and its Member States and Co-operating States. In addition it has most of the connections for WMO Regional Association VI (RA VI) that are part of the WMO's Global Telecommunication System. The RMDCN is used for dissemination of ECMWF's forecast products and exchange of meteorological data (e.g. observations and radar data) between the connected sites. ECMWF manages the RMDCN and monitors the network on behalf of the connected user sites following an agreement with WMO.

Over time the demand for membership of the RMDCN began to grow. Supporting a further limited expansion of the RMDCN while keeping the number of user sites to a manageable level, the ECMWF Council agreed in 2008 to consider the following four categories of countries as potential future members of the RMDCN.

- ECMWF Member States and Co-operating States.
- RA VI countries not currently connected to the RMDCN.
- Countries operating Main Telecommunications Network (MTN) centres, including future Global Information System Centres (GISCs) of the WMO Information System (WIS).
- Countries outside RA VI connected to a RA VI country as part of the GTS, upon request by the RA VI country concerned.

Further details may be found on the ECMWF website at

- <http://www.ecmwf.int/services/computing/rmdcn/>.

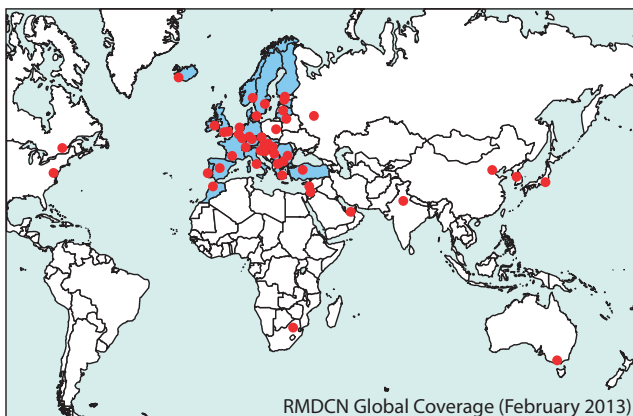


Figure 1 There are 50 sites (46 National Meteorological Centres, ECMWF, 2 EUMETSAT sites and one disaster recovery site in the Netherlands) connected to the network. The shaded countries indicate ECMWF Member States and Co-operating States.

As of early 2013, the number of RMDCN members now stands at 50 and includes National Meteorological Centres in countries such as Japan, China, India, United Arab Emirates, South Korea, Australia, USA, Canada and South Africa, as well as two EUMETSAT sites and one disaster recovery site in the Netherlands (see Figure 1).

The network has also evolved technically as well as geographically. A major change occurred in 2006 when the RMDCN was migrated from the Frame Relay architecture to a more modern one based on Multiprotocol Label Switching (MPLS). This provided several advantages, including improved availability levels, any-to-any connectivity and the provision of Class of Service (CoS) to allow traffic prioritization. Throughout its lifetime the RMDCN has also seen a steady increase in the speed of the connection of the sites, with the bandwidth of the ECMWF Member States Basic Package configuration typically doubling around every three years.

As the resolution of ECMWF's operational models continues to increase, so does the size of files that must be sent to its Member States. One of ECMWF's objectives is to provide the network infrastructure for the dissemination of products so it is vital to periodically verify that the RMDCN is fit for purpose and provides value for money. Therefore, in October 2010 the ECMWF Technical Advisory Committee (TAC) supported a plan presented by ECMWF to initiate a procurement process for the next generation of the network and established a TAC Subgroup on the RMDCN to assist with the definition of requirements and to review the outcome of the procurement.

The procurement process

As described above, the membership of RMDCN extends beyond ECMWF Member States and Co-operating States. Indeed the WMO intends to use the RMDCN as part of the core network for the new Weather Information Service (WIS), so the involvement of WMO was sought throughout the procurement process.

In preparation for the procurement, the TAC Subgroup on the RMDCN and the WMO Task Team on the RMDCN held meetings in 2011 to discuss requirements for the future RMDCN service. Early in 2012 these were finalized and consolidated to form the technical specification of requirements and the draft contract for publication in the Invitation To Tender (ITT).

After the closing date for replies to the ITT there followed several months of comprehensive assessment of the tenders. The evaluation clearly showed that the offer from Interoute Communications Limited (they proposed a network based on MPLS technology offering any-to-any connectivity) provided significantly better overall value for money, even when taking into account the cost of migration to a new provider.

Members of the WMO Task Team on the RMDCN and two other WMO observers attended the TAC Subgroup on the RMDCN and also gave their support to ECMWF's decision to select Interoute as the future supplier for RMDCN Next Generation. The nine-year contract (with a break point after six years) was then signed by the ECMWF Director-General and Interoute on 11 December 2012 (see Figure 2).



Figure 2 Alan Thorpe, ECMWF's Director-General, signing the contract with Lee Myall, UK Regional Director at Interoute Communications Limited, for the provision of the Next Generation of the RMDCN.

Features of the new contract

The discussions of the TAC Subgroup on the RMDCN and the WMO Task Team on the RMDCN resulted in a number of recommendations that have been implemented in the contract.

Contract term and technical/commercial refresh (TCR)

The contract duration for managed data networks is generally around three to five years. However the situation of the RMDCN is very different compared with other companies contracting for network services; the processes that need to be followed to procure a new network make it less flexible to change provider at short notice. The Subgroup noted that there are several reasons in favour of a three-year cycle.

- The lead time for a change of provider is around three years (this includes the whole procurement process and migration of the network).
- Evolution in the market has led in the past to significant cost reductions and chances for technology upgrades around every three years.
- During the life-cycle of the current RMDCN the ECMWF-funded basic package has been upgraded around every three years.

The Subgroup then assessed the various advantages and disadvantages of longer initial contract terms and recommended the following scheme, based on a three-year cycle:

- Full contract term of nine years with a break clause at the end of the sixth year, to allow its potential termination in the case of persistent breaches of the Service Level Agreement.
- Technical/commercial refresh (TCR) with a guaranteed set of technology and/or cost benefits to the RMDCN after three years and six years (if the break clause is not used).

The TCR should ensure value for money over the duration of the contract, in recognition of the fact that the cost of networking technology has historically reduced over time. Individual countries will be able to decide whether to save money by paying less for their connection, or to upgrade their connection within the existing budget envelope.

The contract was successfully negotiated on the above terms.

For ECMWF Member States: the Basic Package configuration

As discussed earlier, ECMWF provides the network infrastructure for the dissemination of its products to its Member States. The configuration, known as the 'Basic Package', is the same for each ECMWF Member State and is based on a high availability requirement with sufficient bandwidth to guarantee on-time delivery for a critical set of ECMWF products. Migration to the new service provider will have a beneficial impact on Member States as the bandwidth of the Basic Package agreed with Interoute (4 Mbps) will be double the current speed. All sites will have the option to be connected at higher speeds (at their own additional cost) if they wish to do so.

Site types

In the current network with OBS effectively the only distinction made between the user sites is whether they are 'mission critical' or not. Mission critical implies a higher level of resilience, typically with an automatic failover to a backup circuit of the same speed.

One of the key requirements identified by the TAC Subgroup on the RMDCN was for a larger choice of configuration options (predefined 'site types'), allowing users a better opportunity to choose the solution that is most cost-effective for their particular needs. The Subgroup also considered that more flexibility in defining the site types would be beneficial. In particular it proposed that lower grade access lines might be considered when costs would be prohibitively high in certain geographical areas. ECMWF has agreed with Interoute six site types: Platinum (most resilient and most expensive), Gold, Silver, Bronze, Copper and Iron.

The site types are differentiated by a number of factors, for example, the level of resilience, the quality and speed of backup, the level of service availability and the expected elapsed time for technical problems to be fixed.

Many sites will require the highly resilient Platinum site configuration, allowing a fully resilient mission critical setup with transparent backup arrangements.

At the lower end of the scale, the Iron site type allows a very cost effective option for some countries to connect to the RMDCN. It uses the Internet as a means to access the MPLS core network, using either a dedicated Internet access provided by Interoute (Iron A) or the available Internet access on the site (Iron B).

The site availability service levels vary for the site types, starting at a very high 99.97% for Platinum sites reducing to 99.8% for Copper sites. Iron A sites have much lower service level (95.3%) while for Iron B sites there is no contracted service level due to the fact that Interoute has no control at all over the access to the network.

Future technologies

The contract allows for various upgrades for the network service; for example, to introduce new technologies such as the IPv6 protocol and multicast traffic as they mature during the term of the contract.

Migration

Migration of an operational network of this size is not a straightforward exercise so planning work began immediately after the contract was signed. Before migration can take place, all sites have to select their site configurations and access speeds. The network will then be implemented in stages (in parallel to the still-operational OBS network) and its suitability for operational use will have to be tested thoroughly before letting go of the existing network.

The first step is to deploy a Pilot Network in the first half of 2013 in order to check out the new provider's capabilities. In cooperation with Interoute, we have selected sites considered to be representative for the whole community (ECMWF Member States, RA VI sites and sites outside Europe). The sites participating in the Pilot Network are: Austria, Belgium, Sweden, Bulgaria, Japan and ECMWF.

Following acceptance of the Pilot Network, orders will be submitted on 1 July 2013 for all other sites that have agreed their configuration, signed the order and the Accession Agreement (if they need to). This is the cut-off date for sites to be part of the so-called Initial Deployment.

Acceptance testing forms an important part of the move to a new network. There are four types of testing that will take place during the migration; two of these focus on the individual site installation, while the other two focus on the performance of the network as a whole.

Once the new network equipment has been installed and handed over to the site, the RMDCN team at ECMWF will carry out the *Site Functional Acceptance Test* to ensure that the equipment is functioning as it should. Some of the areas to check are router configuration, access line speed, the ability to 'talk' to other RMDCN user sites and backup functionality.

The *Site Reliability Acceptance Test* will follow the successful completion of the functional acceptance test and will check whether the service at an individual site meets the conditions of the Service Level Agreement (SLA) over a seven-day period.

The *Pilot Network Reliability Acceptance Test* will check, over a seven-day period, whether the service for the network of pilot sites meets the SLA. The Pilot Network Reliability Acceptance Test must be successfully completed within 35 calendar days of handover of all pilot sites.

Finally, the *Global Network Reliability Acceptance Test* will determine whether the new network as a whole performs to the required standard. It is again performed over a seven-day period. If the network fails to pass the test within the 30-day period then ECMWF has the right to terminate the contract.

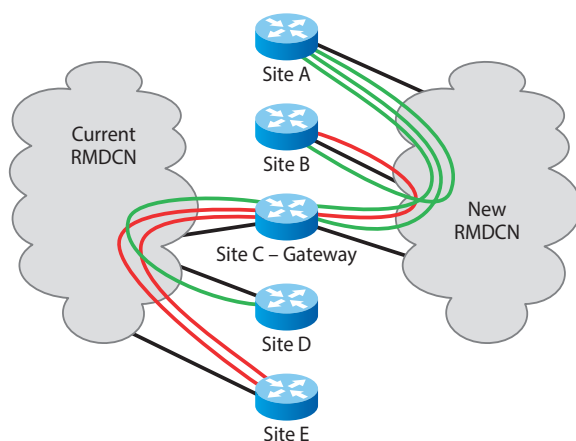


Figure 3 A graphical representation of a point during the migration from the current RMDCN to the new RMDCN. A 'gateway site' (planned to be ECMWF) will allow communication between sites that have already been migrated to the new network and those which are still operating on the old network.

Due to the fact that the primary consideration is to ensure that connectivity is maintained between all sites at all times, it was decided that a ‘big-bang’ approach – i.e. an instantaneous switch-over from the old network to the new – would be far too risky. Instead there will be a designated period of one month, during which all sites will be switched over.

During this period, ECMWF will act as a gateway between the current OBS network and the new Interoute network, thus enabling all RMDCN sites to continue to inter-communicate during the migration, whether they are on the OBS network or have already migrated to Interoute (see Figure 3). However, in order to minimise the overhead of running parallel networks, ECMWF will cease its connection to OBS in early May 2014. All currently connected sites are therefore being strongly advised to order their connections before 1 July 2013, so that they can be part of the Initial Deployment. Sites not part of the Initial Deployment will not be connected to the new RMDCN network until after the end of the one-month migration window (February 2014), on a business-as-usual basis.

Table 1 provides an overview of the migration plan timetable.

Preparing for the future

As the requirements on the RMDCN continue to grow, whether due to higher data volumes, increasing bandwidths or a continuing demand for membership from the wider WMO community, the next generation network will be in an excellent position to meet those requirements readily and cost-effectively.

Event	Due date (latest)
Contract Signature	11 December 2012
Pilot network phase	
ECMWF submits order forms for all Pilot Sites	4 February 2013
Interoute hands over all Pilot Sites	26 May 2013
Successful completion of Pilot Network Reliability Acceptance Test Formal acceptance of Pilot Network	30 June 2013
Initial deployment phase	
Order forms for a minimum of sixteen sites to be submitted, comprising at least the remaining ECMWF Member States. All these User Sites plus the six Pilot Sites are part of the Initial Deployment	1 July 2013
Start of Site and Network Reliability Acceptance Tests	20 November 2013
Successful completion of Global Network Reliability Acceptance Test Formally acceptance of new network	20 December 2013
Network Migration starts (for all sites part of the Initial Deployment)	6 January 2014
Network Migration finishes	6 February 2014

Table 1 Planned timeline of the migration to RMDCN – Next Generation.

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