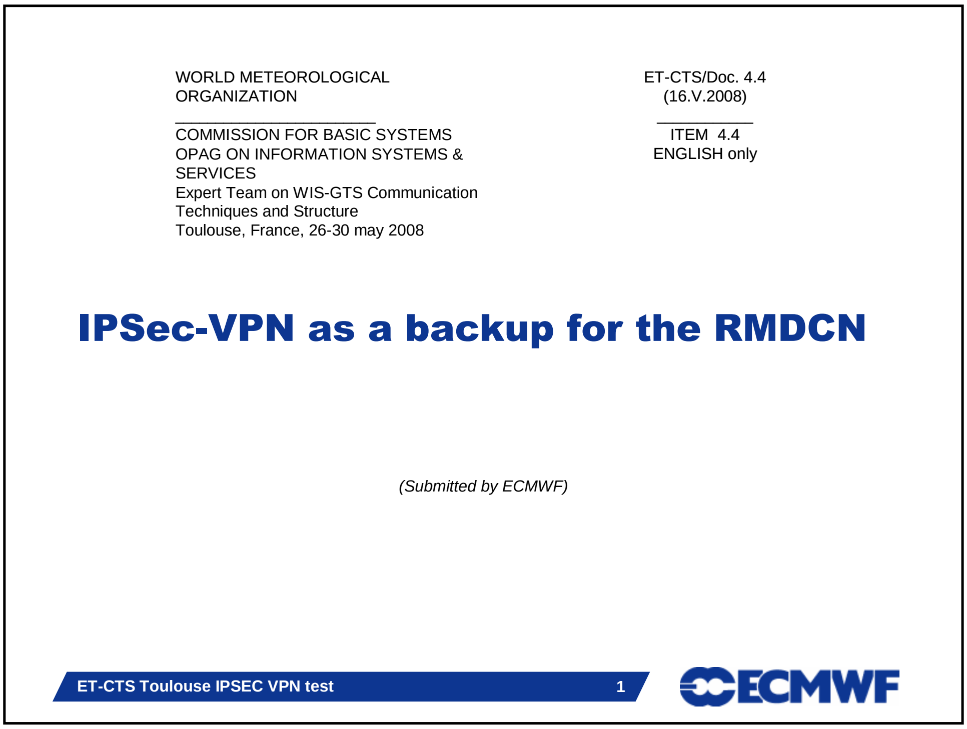

WORLD METEOROLOGICAL ORGANIZATION
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COMMISSION FOR BASIC SYSTEMS
OPAG ON INFORMATION SYSTEMS & SERVICES
Expert Team on WIS-GTS Communication Techniques and Structure
Toulouse, France, 26-30 may 2008

ET-CTS/Doc. 4.4
(16.V.2008)
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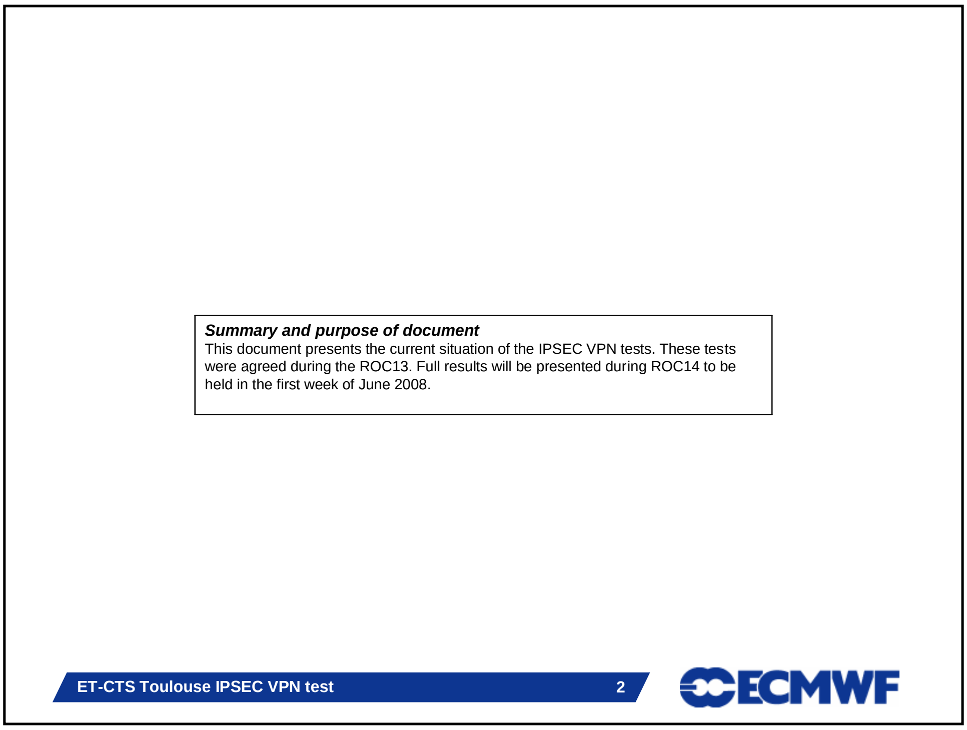
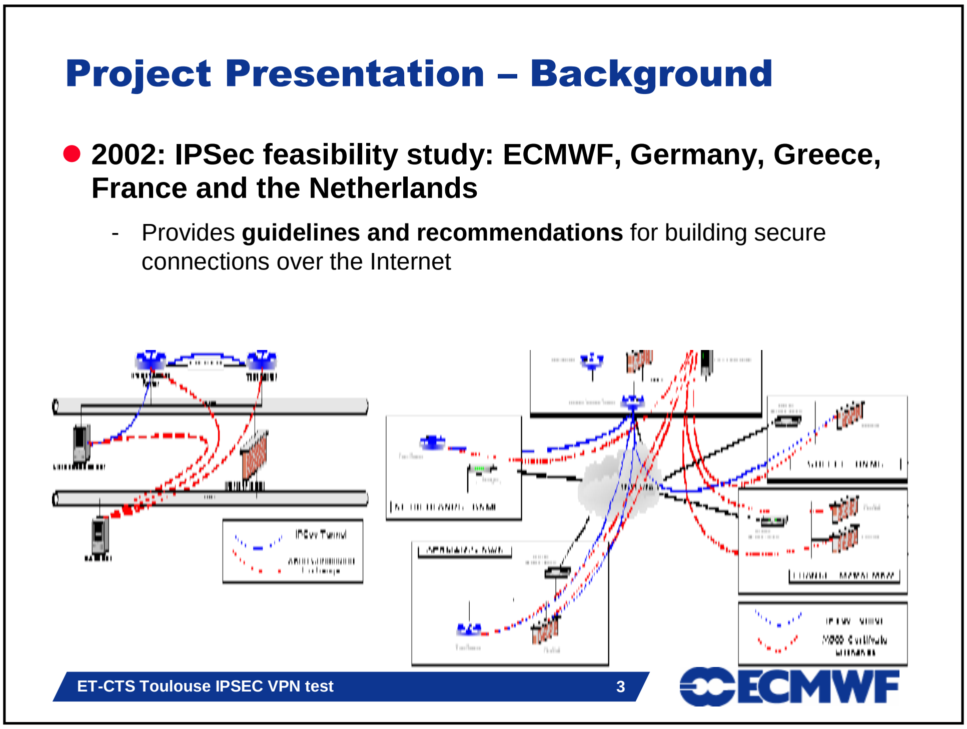
ITEM 4.4
ENGLISH only

# IPSec-VPN as a backup for the RMDCN

*(Submitted by ECMWF)*



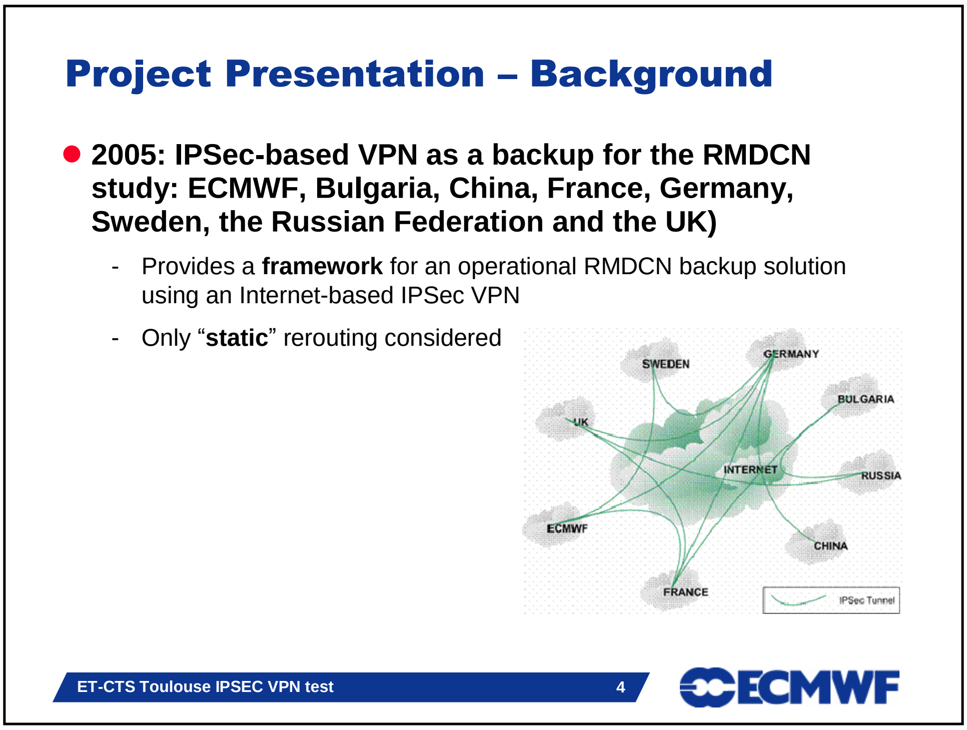
**_Summary and purpose of document_**
This document presents the current situation of the IPSEC VPN tests. These tests were agreed during the ROC13. Full results will be presented during ROC14 to be held in the first week of June 2008.



## Project Presentation – Background

- 2002: IPSec feasibility study: ECMWF, Germany, Greece, France and the Netherlands
  - Provides **guidelines and recommendations** for building secure connections over the Internet

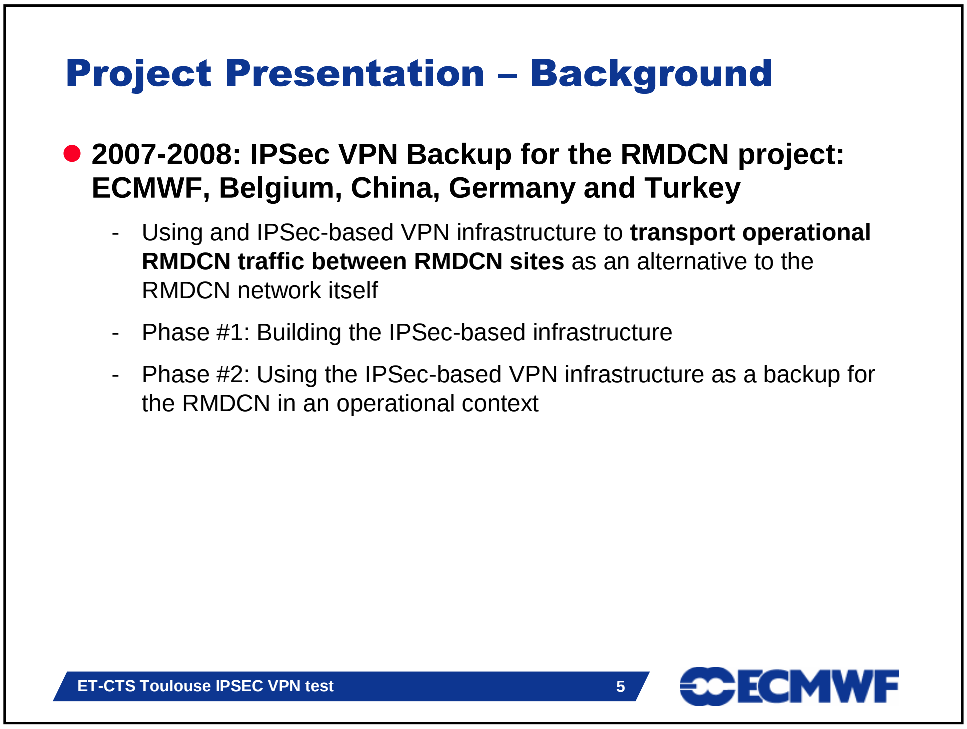
ECMWF



## Project Presentation – Background

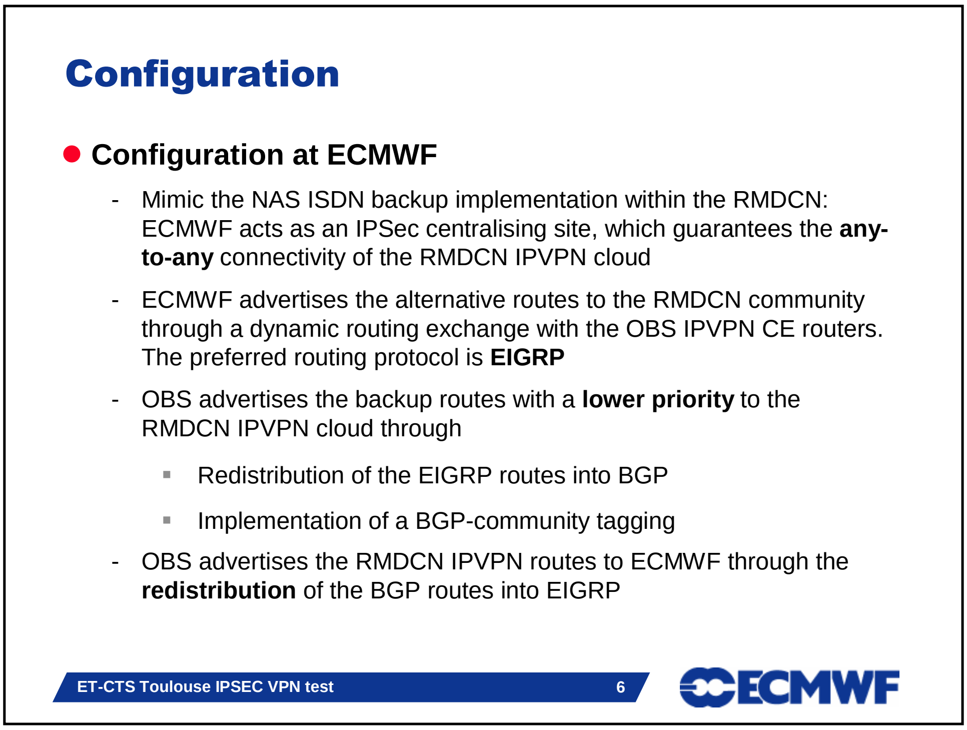
- 2005: IPSec-based VPN as a backup for the RMDCN study: ECMWF, Bulgaria, China, France, Germany, Sweden, the Russian Federation and the UK)
  - Provides a **framework** for an operational RMDCN backup solution using an Internet-based IPSec VPN
  - Only “**static**” rerouting considered

ECMWF



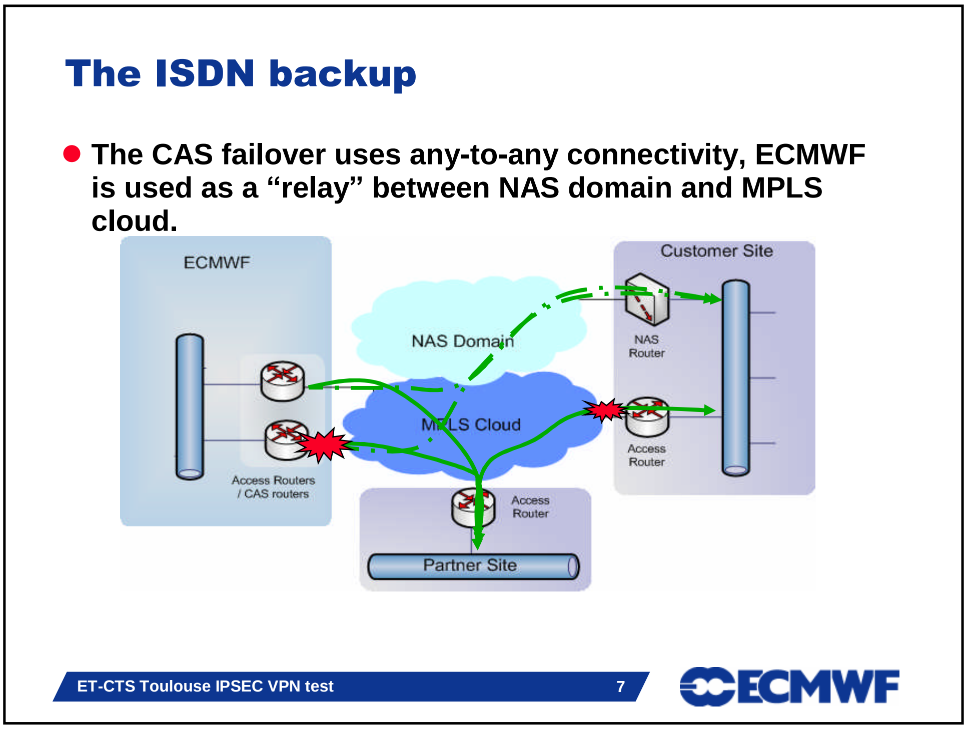
## Project Presentation – Background

- **2007-2008: IPSec VPN Backup for the RMDCN project: ECMWF, Belgium, China, Germany and Turkey**
  - Using and IPSec-based VPN infrastructure to **transport operational RMDCN traffic between RMDCN sites** as an alternative to the RMDCN network itself
  - Phase #1: Building the IPSec-based infrastructure
  - Phase #2: Using the IPSec-based VPN infrastructure as a backup for the RMDCN in an operational context



## Configuration

- **Configuration at ECMWF**
  - Mimic the NAS ISDN backup implementation within the RMDCN: ECMWF acts as an IPSec centralising site, which guarantees the **any-to-any** connectivity of the RMDCN IPVPN cloud
  - ECMWF advertises the alternative routes to the RMDCN community through a dynamic routing exchange with the OBS IPVPN CE routers. The preferred routing protocol is **EIGRP**
  - OBS advertises the backup routes with a **lower priority** to the RMDCN IPVPN cloud through
    - Redistribution of the EIGRP routes into BGP
    - Implementation of a BGP-community tagging
  - OBS advertises the RMDCN IPVPN routes to ECMWF through the **redistribution** of the BGP routes into EIGRP

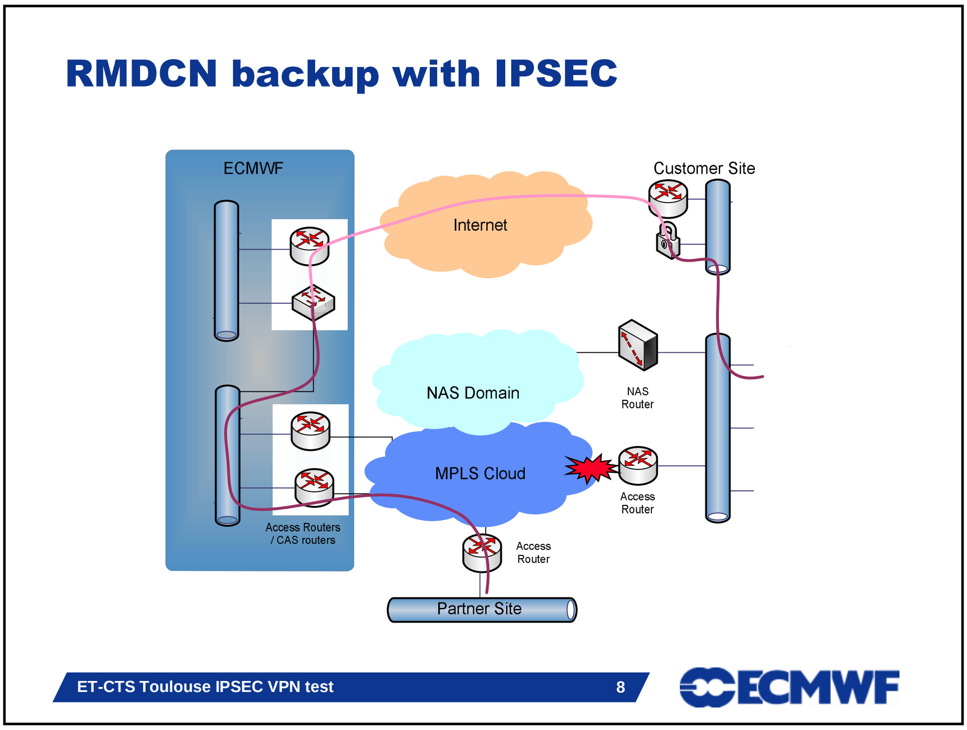


## The ISDN backup

- The CAS failover uses any-to-any connectivity, ECMWF is used as a “relay” between NAS domain and MPLS cloud.

ET-CTS Toulouse IPSEC VPN test 7

ECMWF



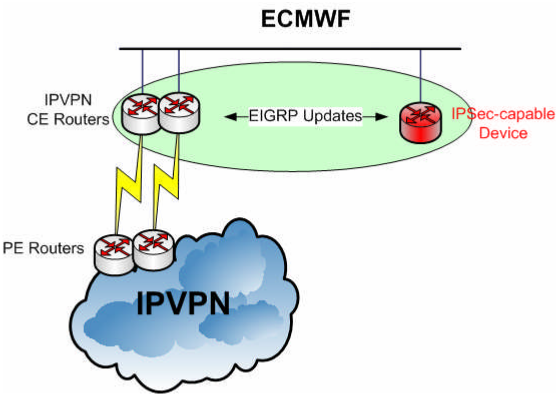
## RMDCN backup with IPSEC

ET-CTS Toulouse IPSEC VPN test 8

ECMWF

# Configuration

- Configuration at ECMWF

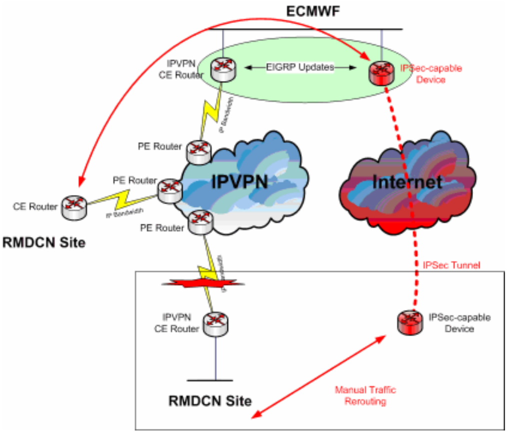


# Configuration

- Configuration at an RMDCN site – Option #1: using manual rerouting
  - The IPVPN CE router is not involved in any dynamic protocol exchange with any local network equipment
  - In case of outage, the local site is responsible for manually rerouting the operational RMDCN traffic though the permanently established IPSec tunnel with ECMWF via the local site IPSec-capable device. This could be done either by using static routes or a dynamic routing protocol

## Configuration

- ECMWF acts as proxy for the site:
  - It forwards the traffic to the RMDCN-IPVPN cloud
  - It receives any traffic sent towards this site through the activation of the backup route(s) using the EIGRP redistribution into BGP and forwards it through the IPSec tunnel

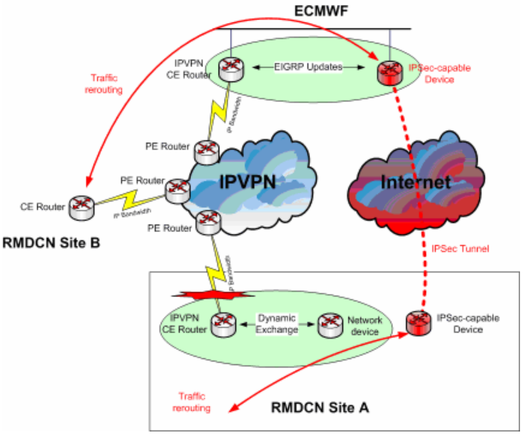


## Configuration

- **Configuration at an RMDCN site – Option #2: using dynamic routing protocol**
  - A dynamic routing protocol exchange is implemented between the IPVPN CE router and a local network device
  - The local site uses this dynamic routing protocol to route its operational RMDCN traffic towards the IPVPN CE router
  - In case of outage, the local site network device reroutes all the operational RMDCN traffic towards the IPSec-capable device
  - The IPSec-capable device forwards this traffic to ECMWF through the permanently established IPSec tunnel with ECMWF

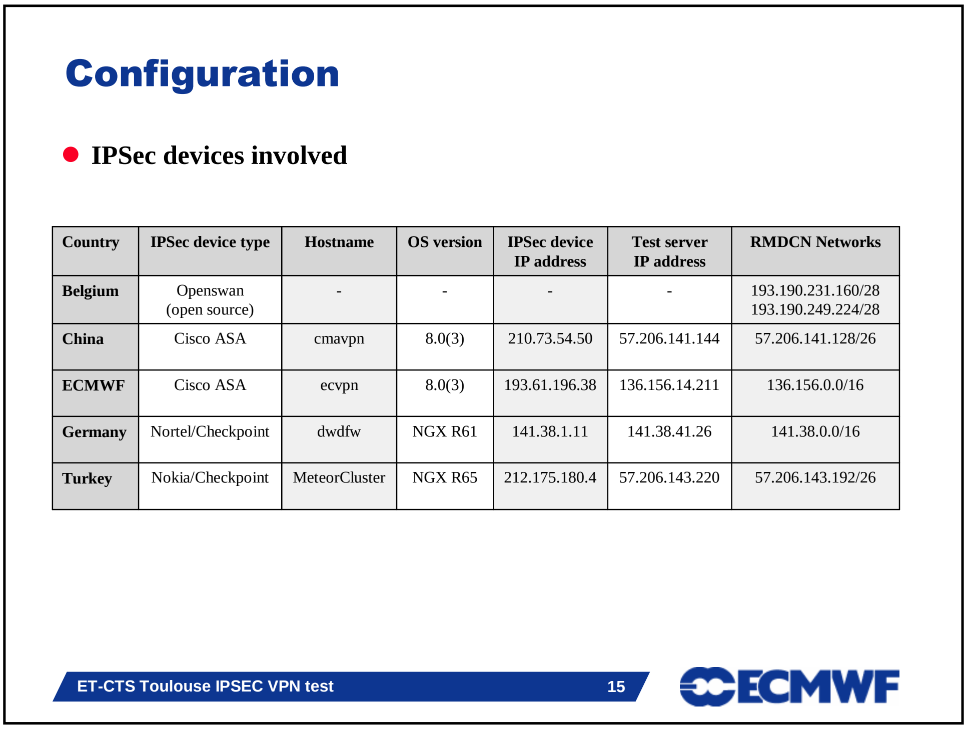
## Configuration

- ECMWF acts as proxy for the site:
  - It forwards the traffic to the RMDCN-IPVPN cloud
  - It receives any traffic sent towards this site through the activation of the backup route(s) using the EIGRP redistribution into BGP and forwards it through the IPSec tunnel



## Configuration

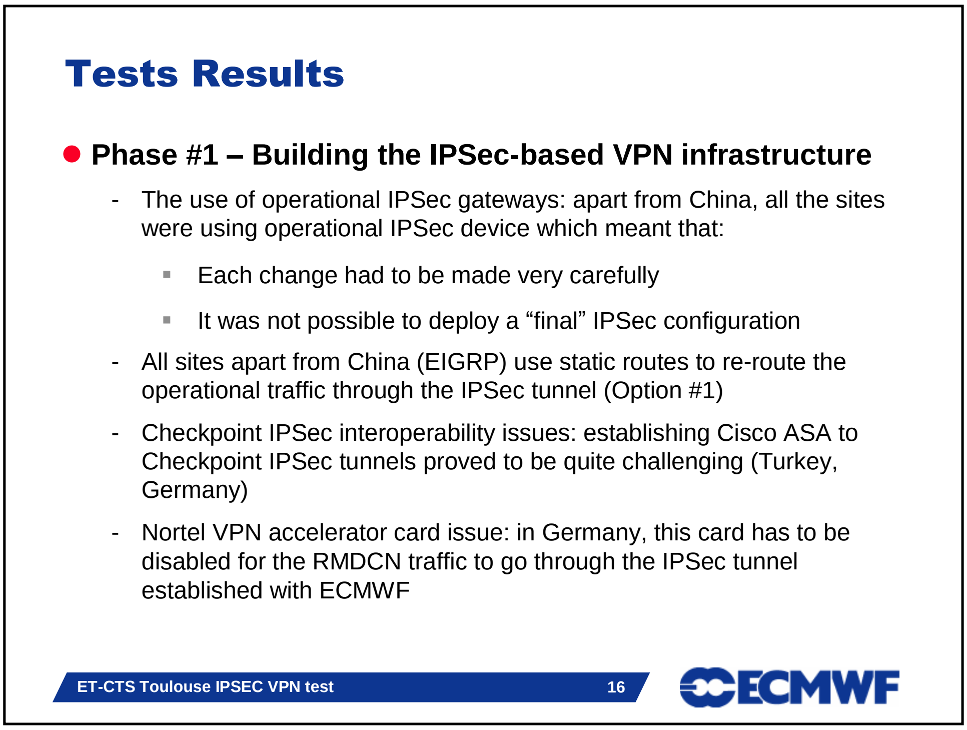
- **IPSec tunnel specifications**
  - As recommended in the previous IPSec Studies:
    - Device authentication: X509 certificates, it is the most scalable and the most secure authentication method, using the already existing ECMWF Public Key Infrastructure (PKI)
    - IKE session key exchange: Deffie-Hellman group 2 or higher
    - Data integrity: the use of ESP HMAC, either MD5 or SHA
    - Data encryption: either ESP_NULL or ESP_AES
  - Tests preparations
    - Allow the IPSec traffic towards the remote sites
    - X509 certificate enrollment with the ECMWF CA server
    - Set-up of the IPSec configuration



# Configuration

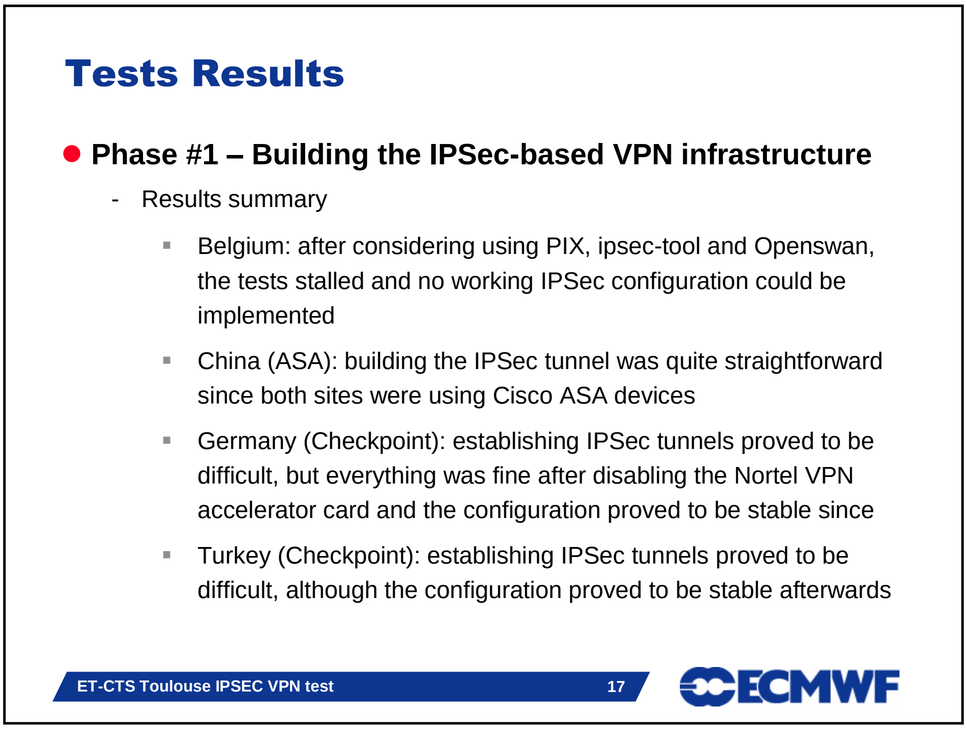
- **IPSec devices involved**

| Country | IPSec device type | Hostname | OS version | IPSec device IP address | Test server IP address | RMDCN Networks |
|---|---|---|---|---|---|---|
| **Belgium** | Openswan (open source) | - | - | - | - | 193.190.231.160/28<br>193.190.249.224/28 |
| **China** | Cisco ASA | cmavpn | 8.0(3) | 210.73.54.50 | 57.206.141.144 | 57.206.141.128/26 |
| **ECMWF** | Cisco ASA | ecvpn | 8.0(3) | 193.61.196.38 | 136.156.14.211 | 136.156.0.0/16 |
| **Germany** | Nortel/Checkpoint | dwdfw | NGX R61 | 141.38.1.11 | 141.38.41.26 | 141.38.0.0/16 |
| **Turkey** | Nokia/Checkpoint | MeteorCluster | NGX R65 | 212.175.180.4 | 57.206.143.220 | 57.206.143.192/26 |



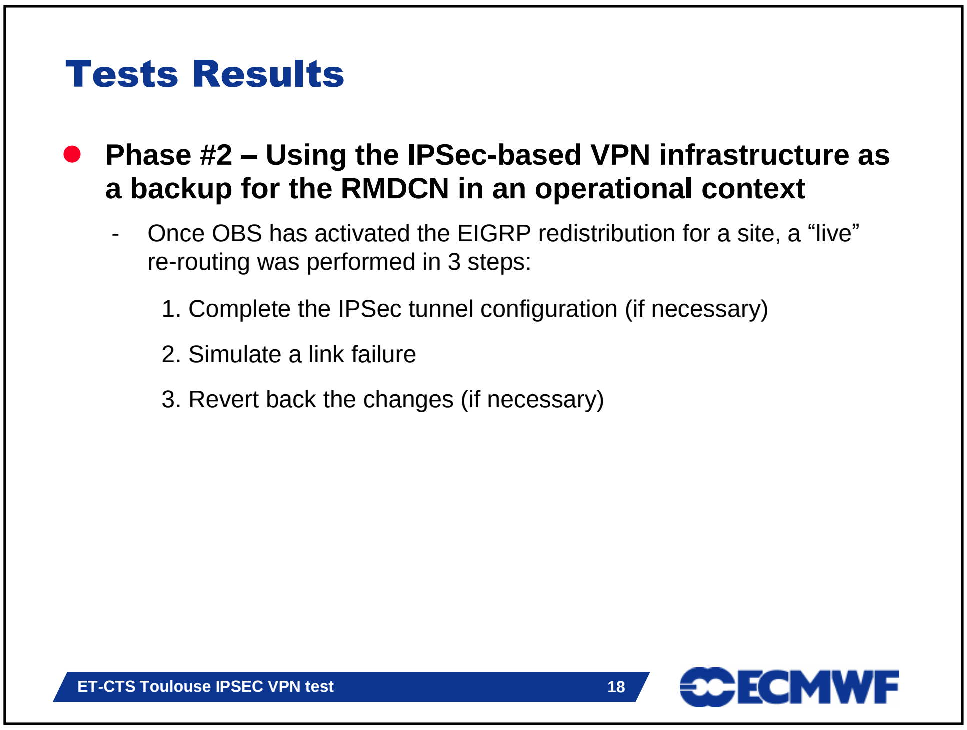
# Tests Results

- **Phase #1 – Building the IPSec-based VPN infrastructure**
  - The use of operational IPSec gateways: apart from China, all the sites were using operational IPSec device which meant that:
    - Each change had to be made very carefully
    - It was not possible to deploy a “final” IPSec configuration
  - All sites apart from China (EIGRP) use static routes to re-route the operational traffic through the IPSec tunnel (Option #1)
  - Checkpoint IPSec interoperability issues: establishing Cisco ASA to Checkpoint IPSec tunnels proved to be quite challenging (Turkey, Germany)
  - Nortel VPN accelerator card issue: in Germany, this card has to be disabled for the RMDCN traffic to go through the IPSec tunnel established with ECMWF



## Tests Results

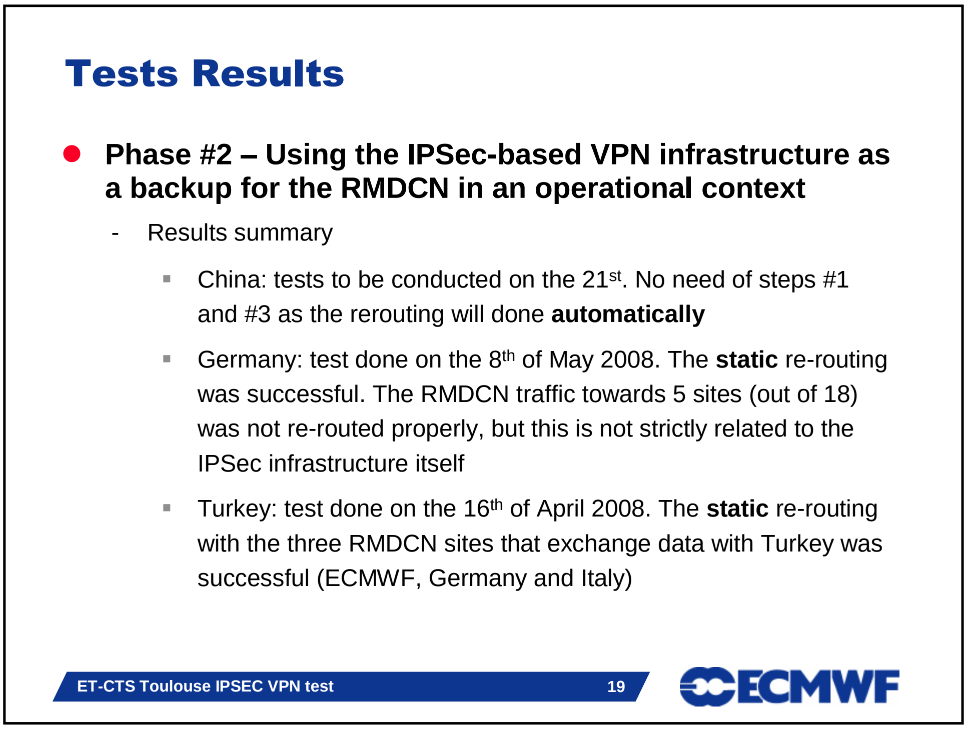
- **Phase #1 – Building the IPSec-based VPN infrastructure**
  - Results summary
    - Belgium: after considering using PIX, ipsec-tool and Openswan, the tests stalled and no working IPSec configuration could be implemented
    - China (ASA): building the IPSec tunnel was quite straightforward since both sites were using Cisco ASA devices
    - Germany (Checkpoint): establishing IPSec tunnels proved to be difficult, but everything was fine after disabling the Nortel VPN accelerator card and the configuration proved to be stable since
    - Turkey (Checkpoint): establishing IPSec tunnels proved to be difficult, although the configuration proved to be stable afterwards



## Tests Results

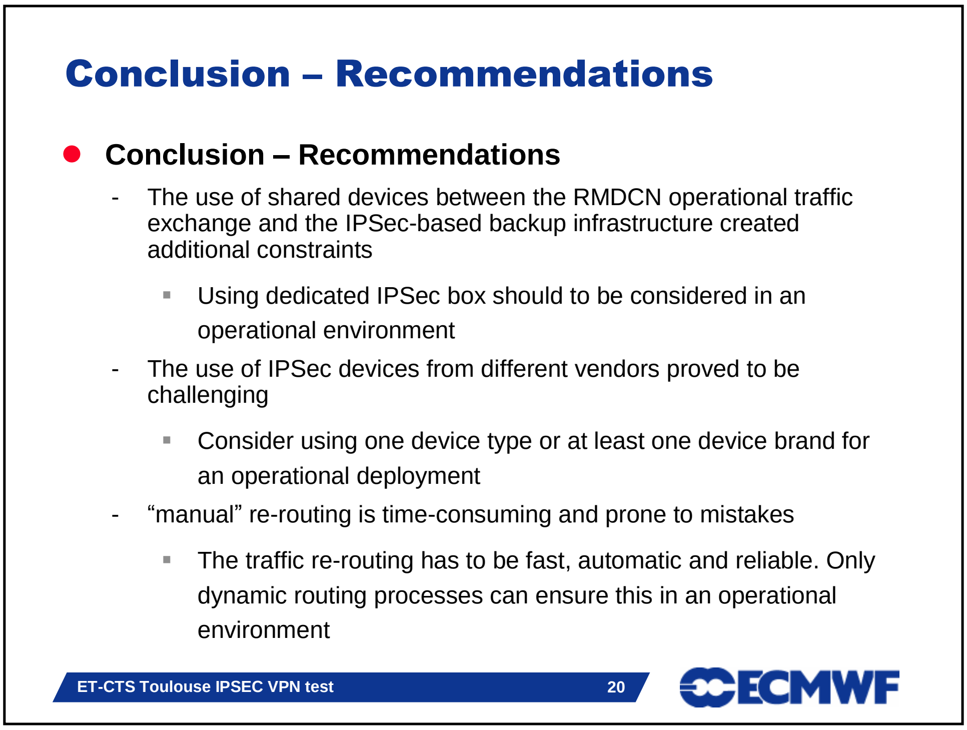
- **Phase #2 – Using the IPSec-based VPN infrastructure as a backup for the RMDCN in an operational context**
  - Once OBS has activated the EIGRP redistribution for a site, a “live” re-routing was performed in 3 steps:

    1. Complete the IPSec tunnel configuration (if necessary)
    2. Simulate a link failure
    3. Revert back the changes (if necessary)



## Tests Results

- **Phase #2 – Using the IPSec-based VPN infrastructure as a backup for the RMDCN in an operational context**
  - Results summary
    - China: tests to be conducted on the 21st. No need of steps #1 and #3 as the rerouting will done **automatically**
    - Germany: test done on the 8th of May 2008. The **static** re-routing was successful. The RMDCN traffic towards 5 sites (out of 18) was not re-routed properly, but this is not strictly related to the IPSec infrastructure itself
    - Turkey: test done on the 16th of April 2008. The **static** re-routing with the three RMDCN sites that exchange data with Turkey was successful (ECMWF, Germany and Italy)



## Conclusion – Recommendations

- **Conclusion – Recommendations**
  - The use of shared devices between the RMDCN operational traffic exchange and the IPSec-based backup infrastructure created additional constraints
    - Using dedicated IPSec box should to be considered in an operational environment
  - The use of IPSec devices from different vendors proved to be challenging
    - Consider using one device type or at least one device brand for an operational deployment
  - “manual” re-routing is time-consuming and prone to mistakes
    - The traffic re-routing has to be fast, automatic and reliable. Only dynamic routing processes can ensure this in an operational environment