EGNOS FOR AFRICA
THE ARCHITECTURE CONCEPT

EGNOS Service Extension to South Africa

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Overview

- EGNOS V2.2 background

- The homogeneous extension approach

- The Regional Extension Module (REM) concept

- Service implementation and infrastructure

- Alternatives to infrastructure

- So what ??

Disclaimer

Views expressed in this presentation are only those of the ESESA Consortium Members and may not reflect nor commit the EC, the GSA and the ESA

The content of this presentation only exposes questions on the technical alternatives for the deployment of EGNOS ground infrastructure in Africa

EGNOS V2.2 Background

- The EGNOS V2.2 (2006) definition includes a preliminary definition of the EGNOS extension architecture for the African continent (ISA extension)

    - ✓ Based on an "homogeneous" extension for MEDA countries
    - ✓ Based on three Regional Extension Modules for sub-Saharan and Southern Africa

- Additional studies were carried out for the extension to the Arabic Peninsula (ARG 3)

MEDA extension

ARG 3

REM A

REM B

REM C

Homogeneous extension principles
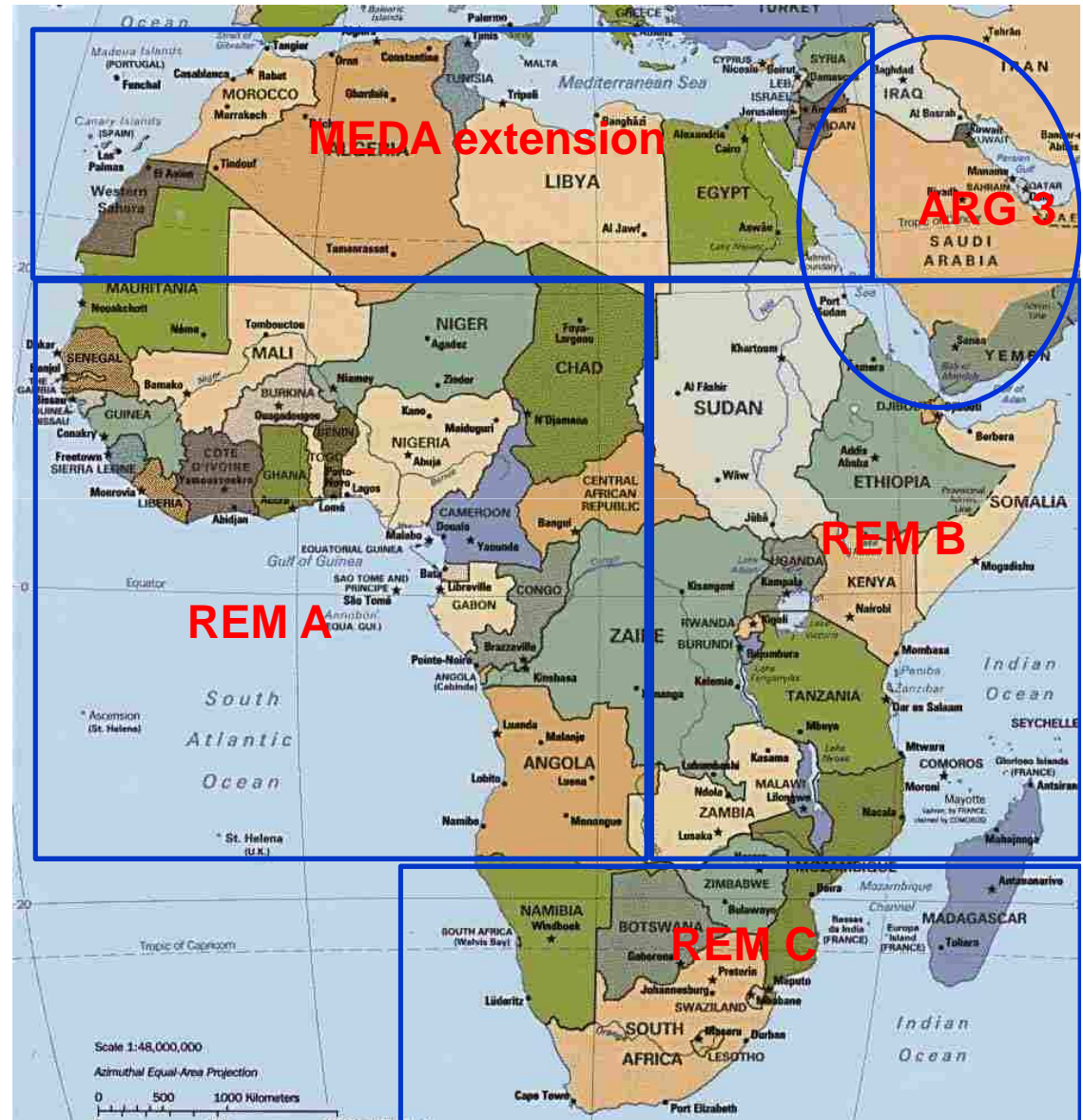
- Homogeneous extension
  - ✓ Consists in the deployment of additional RIMS stations directly connected to the EGNOS Core system (Europe)
  - ✓ No "local" computing of integrity and iono corrections
  - ✓ EGNOS information for the extended area broadcast by EGNOS GEOs.

Regional Extension Module

- The REM concept
  - ✓ Federates a regional RIMS network
  - ✓ Shares data with the EGNOS core system (Europe)
  - ✓ Provides local ionospheric correction computing and system management (Regional Computing Center Facility)
  - ✓ Sends the computed data to the EGNOS Core area which ensure their broadcast from the EGNOS GEOs
  - ✓ Implies the use of specific message (MT 27 and/or MT 28) as per RTCA-DO229 D

Service implementation and infrastructure
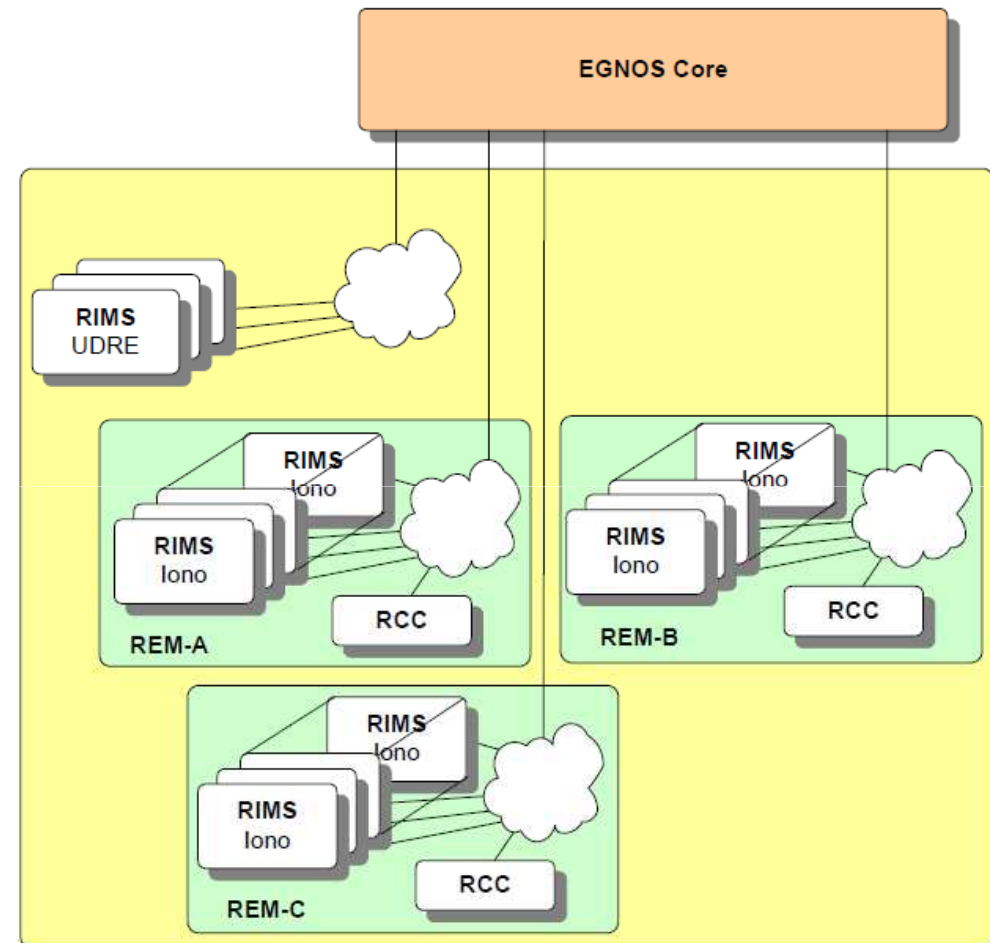
- Service level definition
  - ✓ ISA service coverage : ISA Africa Land Masses area defined as the continental Africa land masses included in the African Service Area and the Island of Madagascar,
  - ✓ ISA Service Level A: Wide aera differential message including GPS satellites integrity service but without ionospheric corrections
  - ✓ ISA Service Level B: Wide aera differential message including GPS satellites integrity service and ionospheric corrections

- Infrastructure for African REMs (according to EGNOS V2.2 definition)
  - ✓ Service Level A:
    - addition of 5 RIMS on top of the existing RIM (Hartebeeshoek)
    - RIMS connected to the EGNOS Core system
  - ✓ Service Level B:
    - Need for around 10 additional Iono RIMS to cover REM C
    - Computing, control and network (Regional WAN) facilities

EGNOS technology evolutions may significantly reduce the necessary infrastructure to deploy the EGNOS service over Africa

Technical alternatives to infrastructure

- Evolutions of the EGNOS design could permit the integration of additional modules of ground stations for the extension of the coverage area without requiring duplications of the core processing facilities.

- Provision of SBAS services in Africa could be realized according to different architectural scenarios of integration with the European system.

- Three approaches (or scenarios) could be imagined:
  - ✓ Independent SBAS system: full and independant replication of the European EGNOS system (ground and space components) operated by African stakeholders
  - ✓ EGNOS full extension to Africa: African facilities (RIMS) for the service provision coupled to the EGNOS core system and GEOs.
  - ✓ Mixed architecture: while avoiding duplication with the EGNOS Core system, the African facilities could implement local processing and system control functions

So What ??

- Previous slides raise more questions than bring answers: I fully agree!...
- ...In addition we should also consider that technically:
  - ✓ SBAS implementation is a stepwise approach
    - The initial architecture might not be representative of the final one due to development/tuning needs to satisfy the performance requirements,
    - SBAS is a regional system: achieving the full coverage of a given country is difficult without involving the neighbour countries (e.g WAAS stations in Canada and Mexico; EGNOS RIMS in MEDA countries)
- Except the option of a full replication of EGNOS, any mixed architecture solution implies:
  - ✓ European service provider (ESSP) and the regional African service providers become "service co-producers",
  - ✓ No regression of performance for the European Core system
  - ✓ A common agreed demonstration of the system performance, safe design and operation
  - ✓ An agreement between the European and Africans service providers for the service provision and liabilities.

The extension architecture is therefore not only a technical question !