SBAS for Africa & Indian Ocean Development Status

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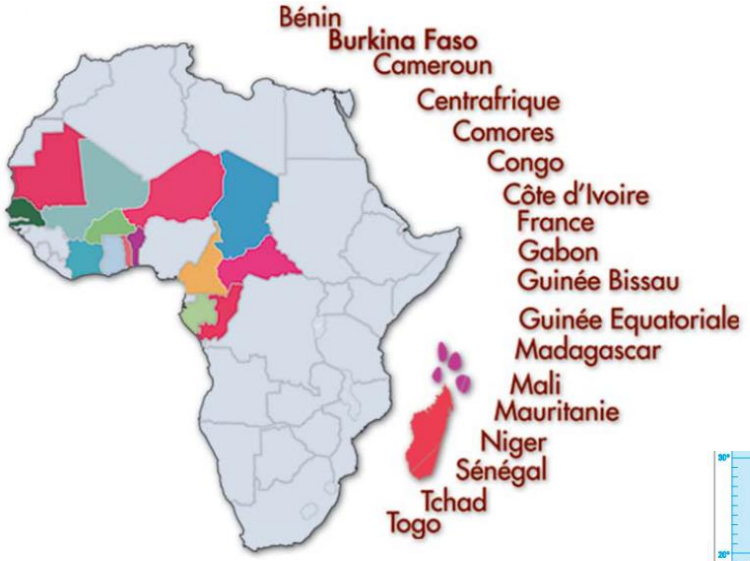
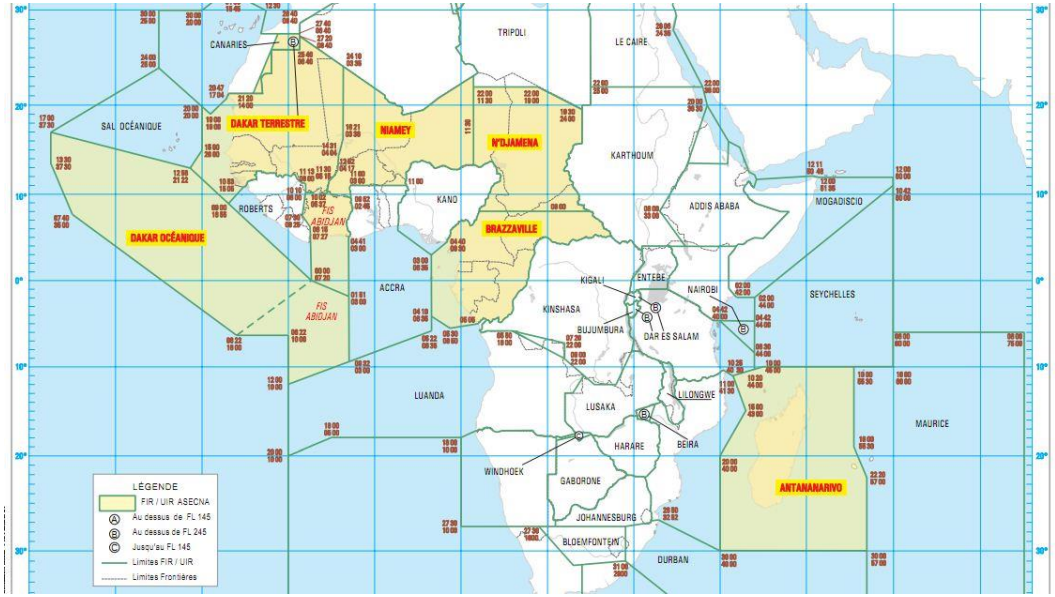
ASECNA at a glance



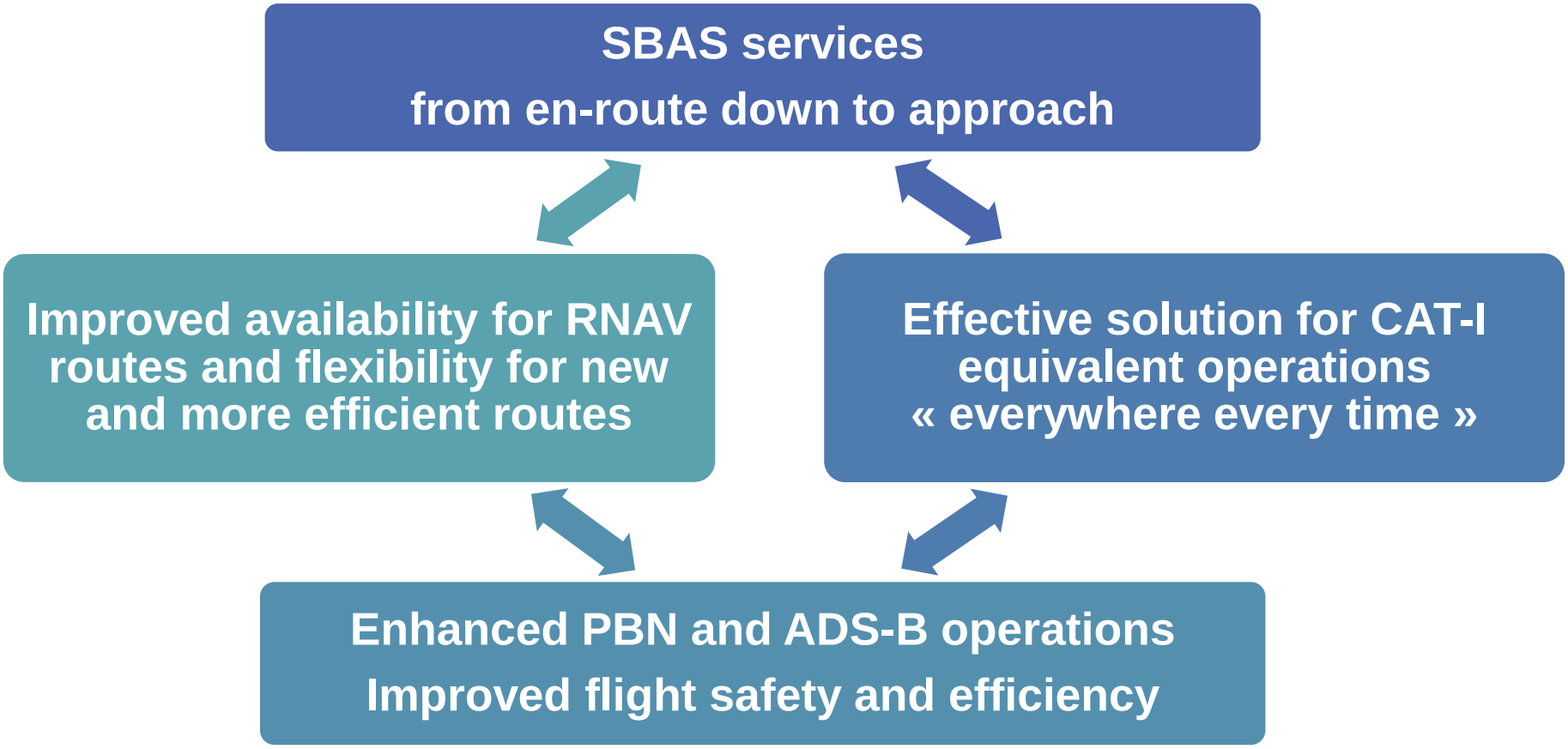
Benin, Burkina Faso, Cameroun, Centrafrique, Congo, Côte d'Ivoire, France, Gabon, Guinée Bissau, Guinée Equatoriale, Madagascar, Mali, Mauritanie, Niger, Sénégal, Tchad, Togo, Union des Comores

International public organisation (18 Member States)

Air navigation services provision within an airspace of 16,1 millions km^2



Operational objectives



Operational objectives

Future pioneer user views on SBAS in Africa:

Safety

- SBAS LPV approaches safer than LNAV/VNAV
  - Not limited by low temperature (vertical profile)
  - Not linked with QFE setting. CFIT / unstable approach risks removed
- Precision approach for all terrains, all runway ends
- Continuity and integrity of GNSS position
  - No RAIM check

Efficiency

- Flexibility, direct routes and closest alternates

ADS-B

- SBAS to support ADS-B as primary means of surveillance
- Decommissioning of radars

Operational objectives

… Services provision plan …

- Incremental implementation in terms of coverage and performances
- Early services (L1) from 2021/2022 for NPA, APV-1 and CAT-I operations
- Full services (DFMC) beyond 2028/2030 for CAT-I autoland operations and potentially further

SBAS for Africa and Indian Ocean = ICAO SP identifier n°7

Strategic directions

- **“Indigenous” continental level navigation augmentation system for Africa, in line with Africa Union Space Policy (Navigation and Positioning)**
- **Key enabler of Single African Sky and of Single African Air Transport Market (SAATM), flagship programme of the African Union under its Agenda 2063**

- **Autonomous services provision to users**
- **Use of EGNOS technology and assets**

The SBAS solution for Africa

Service levels (L1)

- **SoL service** to support en-route/NPA, APV-1 and CAT-I operations with the following target service levels requirements, in line with corresponding ICAO Annex 10 SARPs:

Service level	En-route/NPA	APV-I	CAT-I
Lateral accuracy (95%)	220 m (720 ft)	16 m (52 ft)	16 m (52 ft)
Vertical accuracy (95%)	N/A	20 m (66 ft)	4 m (13 ft)
VNSE in normal conditions	N/A	N/A	P(>10m) = 10^{-7}/150 s
VNSE in degraded conditions	N/A	N/A	P(>15m) = 10^{-5}/150 s
Integrity	1 - 1 x 10^{-7} /h	1 – 2 x 10^{-7}/150 s	1 – 2 x 10^{-7}/150 s
Time-To-Alert (TTA)	10 s	10 s	6 s
HAL	556 m (0,3 NM)	40 m (130 ft)	40 m (130 ft)
VAL	N/A	50 m (164 ft)	35 m (115 ft)
Continuity	1 – 1 x 10^{-5} per hour	1 – 8 x 10^{-6} per approach	1 – 8 x 10^{-6} per approach
Availability	99%	According to ionosphere regimes	

Service levels (L1)

Legacy from SAGAIE project (since 2013):

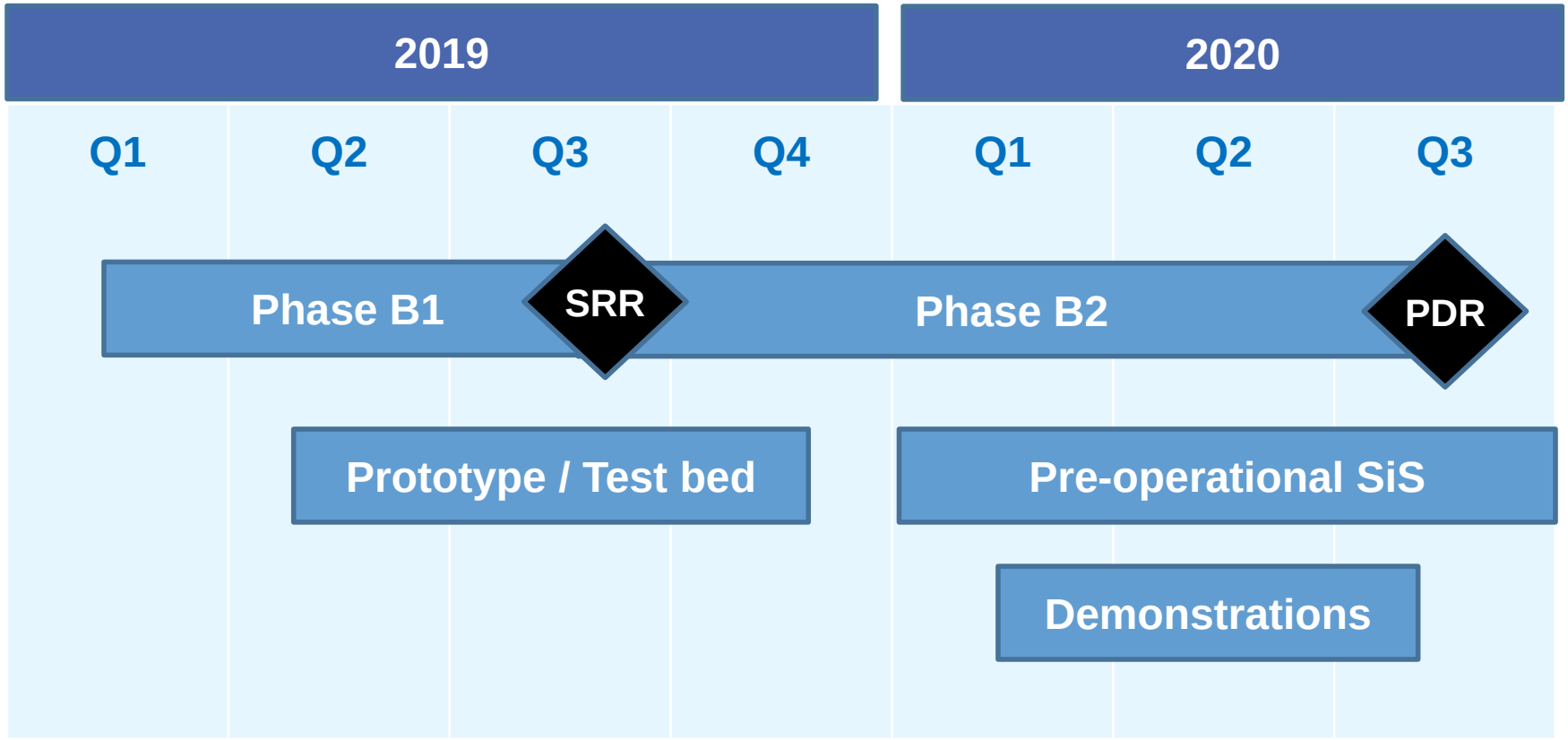
- Importance of the scintillations in the sub-Saharan region
- Need to consider two distinct ionosphere regimes :
  - « Severe » regime, corresponding to the time period combining:
    - years of the central part of the solar cycle, and,
    - 1 month before and after an equinox (spring and fall), and,
    - hours between 6pm and 4am
  - « Nominal » regime elsewhere

Target availability levels

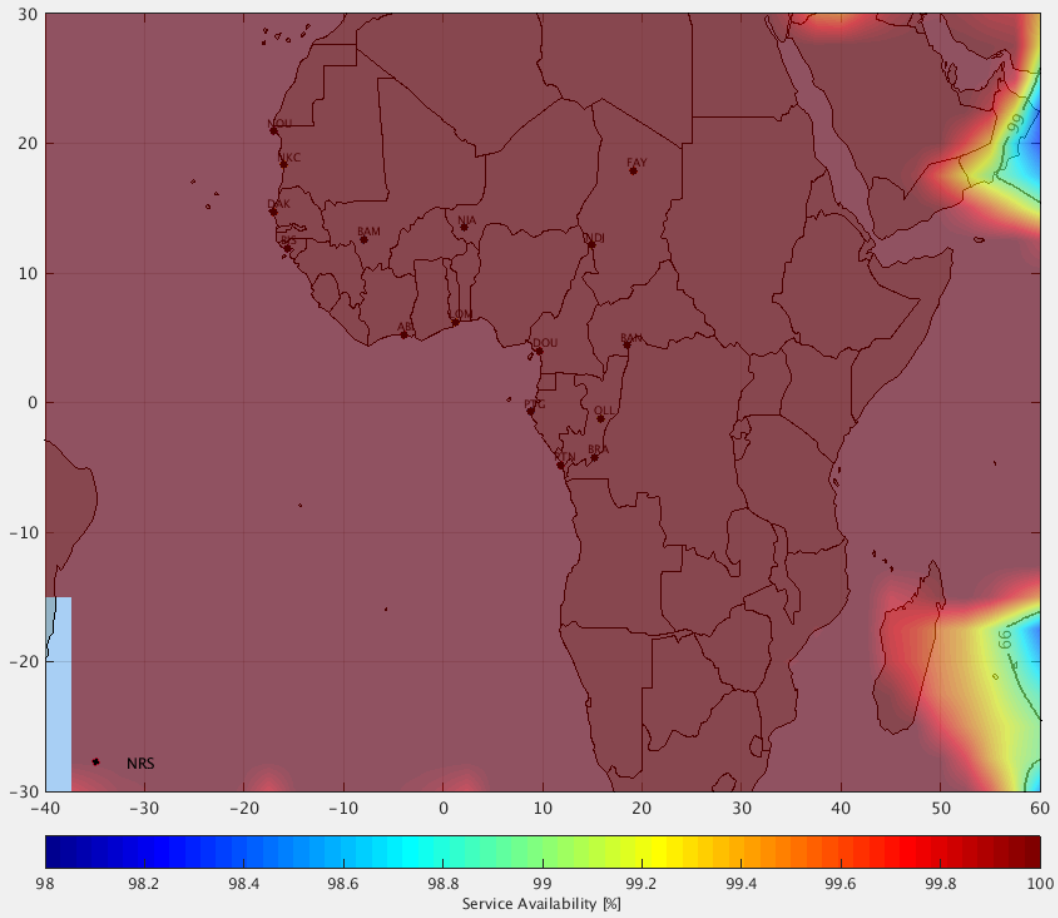
	Nominal regime	Severe regime
ER/NPA	**99%**	**99%**
APV-1	**99%**	**85%**
CAT-I	*Under study*	*Under study*

Main driver

Architecture definition study



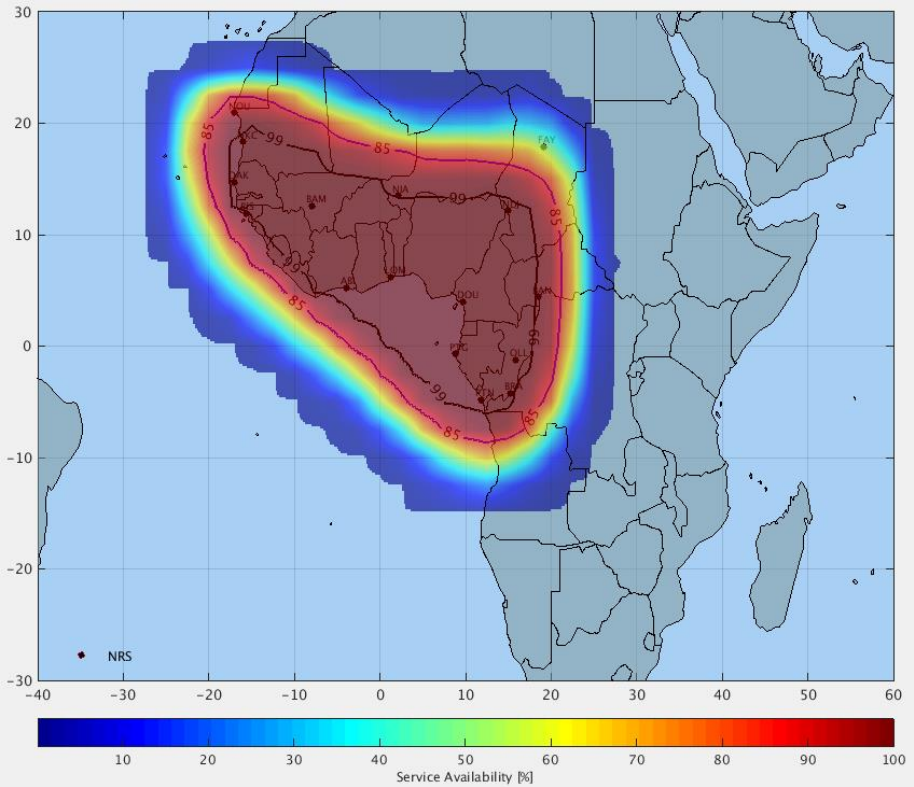
Potential coverage and performances



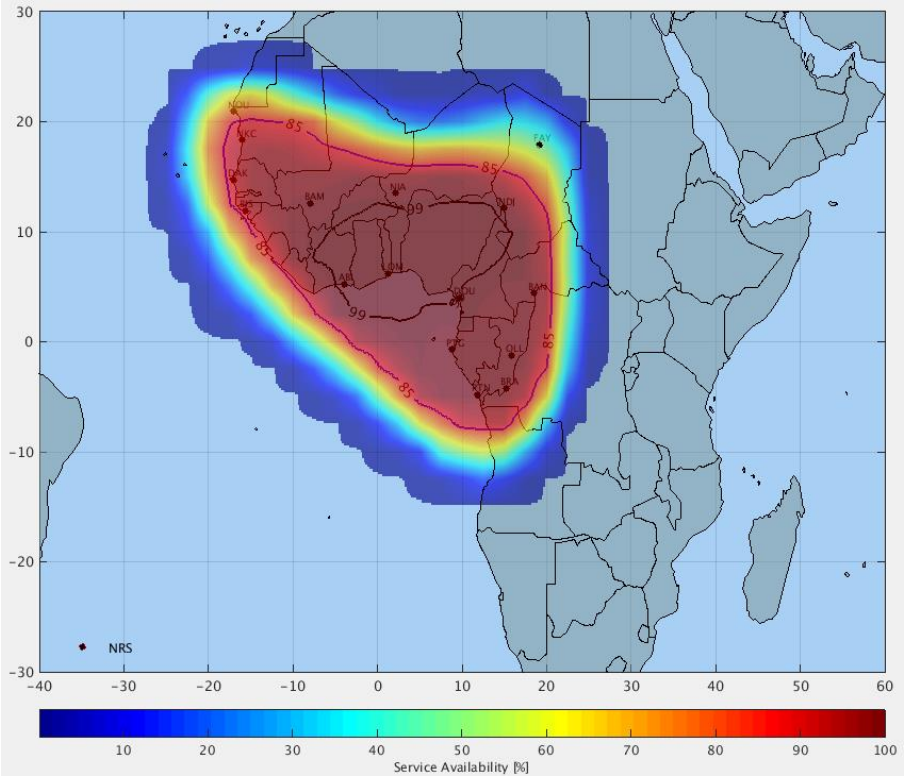
En-route/NPA (nominal and severe regimes)

Simulation conditions: Run NACA, 16 stations

Potential coverage and performances



Nominal regime

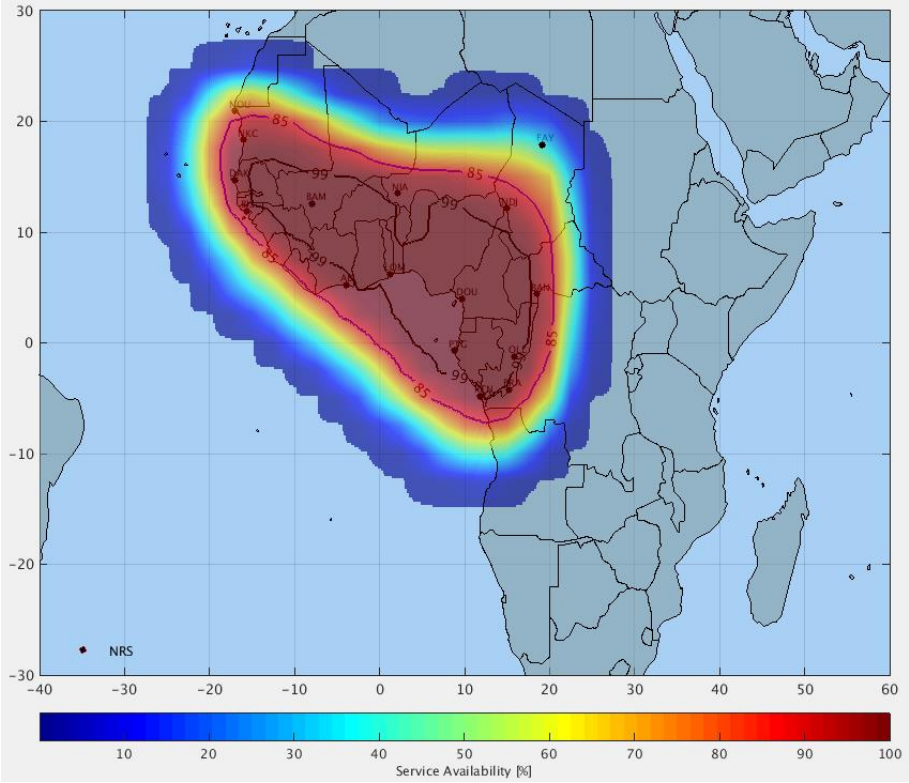


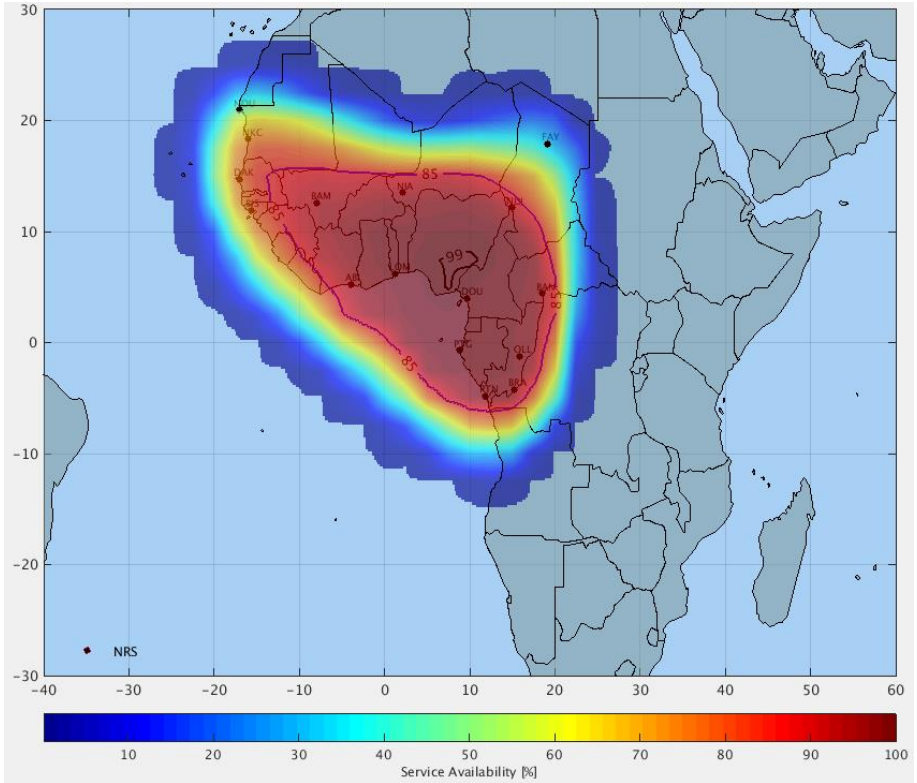
Severe regime

APV-1

Simulation conditions: Run NACA, 16 stations, 20-24 June 2015 and 22-28 Oct. 2013 (6pm - 4am)

Potential coverage and performances





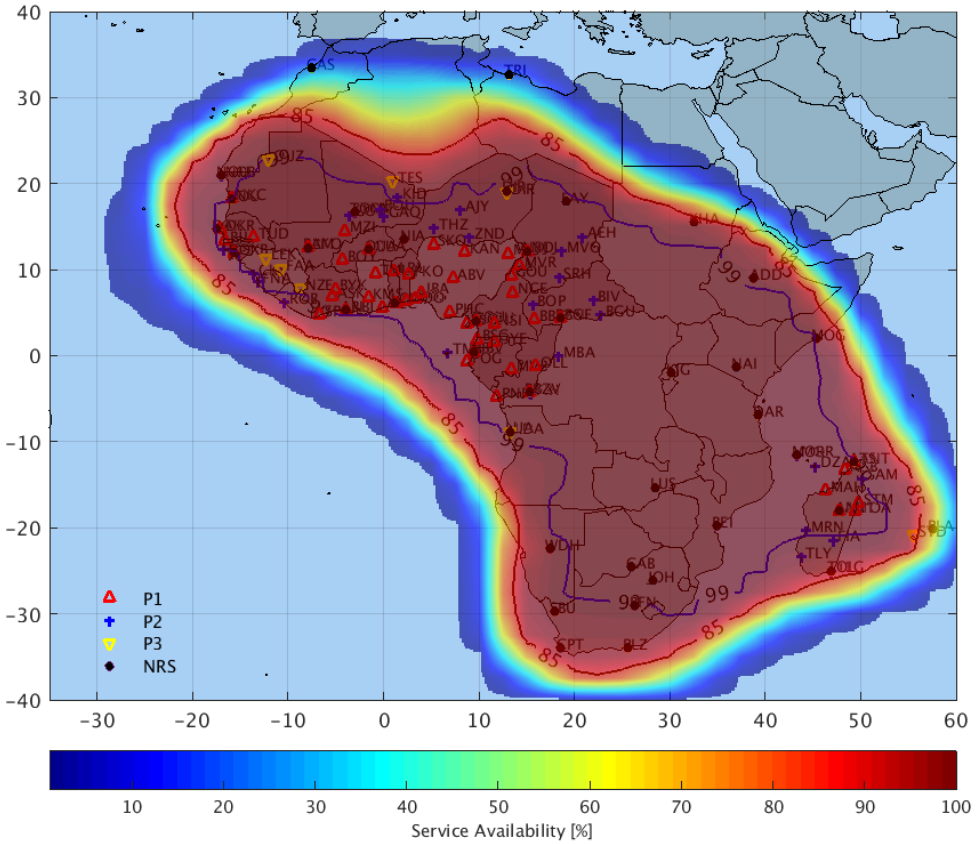
Nominal regime

CAT-I

Severe regime

Simulation conditions: Run NACA, 16 stations, 20-24 June 2015 and 22-28 Oct. 2013 (18h00 - 04h00)

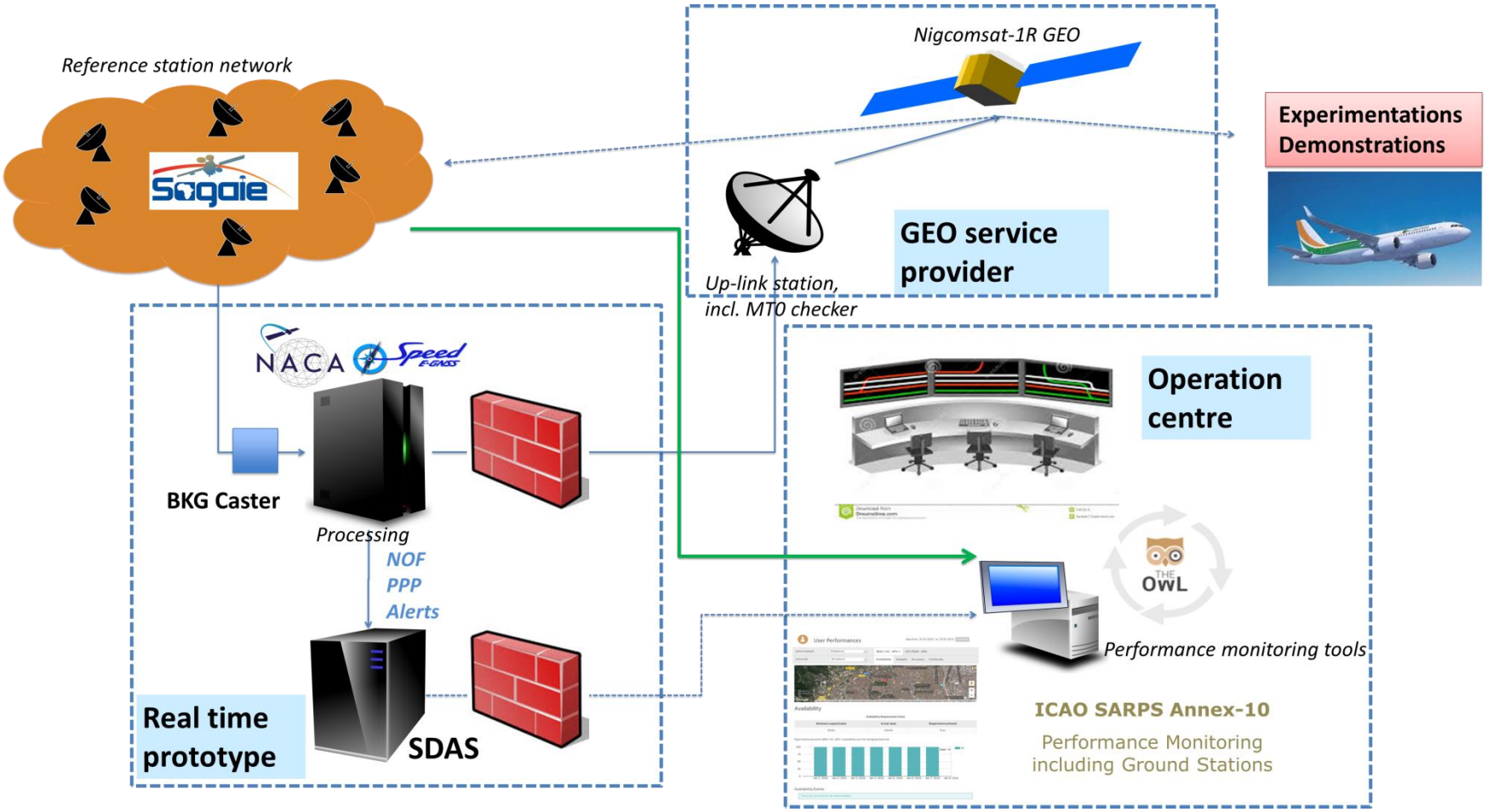
Potential coverage and performances



APV-1 (nominal regime only)

Simulation conditions: Macro-model

Pre-operational service



Deployment by end 2019

Pre-operational service

Test SiS provision throughout 2020

Objectives:

- On-the job training of future operations staff
- Demonstrations/trials:
  - SoL: in-flight demonstrations with partner airlines to showcase the added value and the ease-of-use of LPV approaches:

AIRFRANCE Emirates ASKY Air Côte d'Ivoire

  - Additional services:
    - Precision Point Positioning (PPP)
    - Warning service in charge of broadcasting alerts

Other GNSS/SBAS initiatives in AFI

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EGNOS in Africa Joint Programme Office (JPO)

- Pan African instrument, driven by Africa-EU Partnership and AUC Agenda 2063
- Support to African Union Commission and African stakeholders on GNSS initiatives in all sectors
- Capacity building, programme formulation, impact assessment studies, technical assistance, promotion..
- Some recent achievements :
  - Survey and gap analysis on the Technology and Infrastructure on PNT in Africa (for AUC in support to the operationalisation of the African Space Agency)
  - Economic impact assessment and market studies for SBAS services for Western/Central and Eastern Africa areas
  - Technical support to SBAS in Africa & Indian Ocean definition phase
  - Support to international bodies (ICAO NSP, SBAS IWG)


Les routes du ciel, notre métier
Bénin Burkina Faso Cameroun
Centrafrique Comores Congo
Côte d'Ivoire France Gabon
Guinée Bissau Guinée Equatoriale
Madagascar Mali Mauritanie
Niger Sénégal Tchad Togo
ASECNA