FIG WORKING WEEK 2023
28 May - 1 June 2023 Orlando Florida USA
Protecting Our World, Conquering New Frontiers

Establishment of KSA-CORS Network, its Performance and Future plans

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  - Network infrastructure
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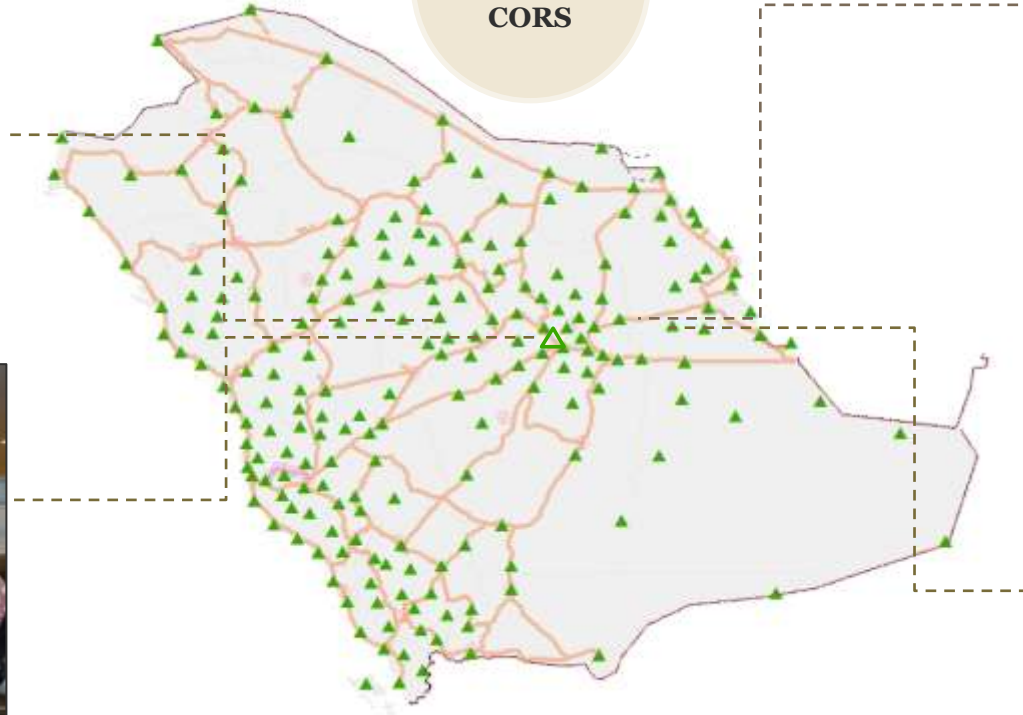
- Future Plan

KSA-CORS Network

Ground Type KSA-CORS

209 KSA-CORS

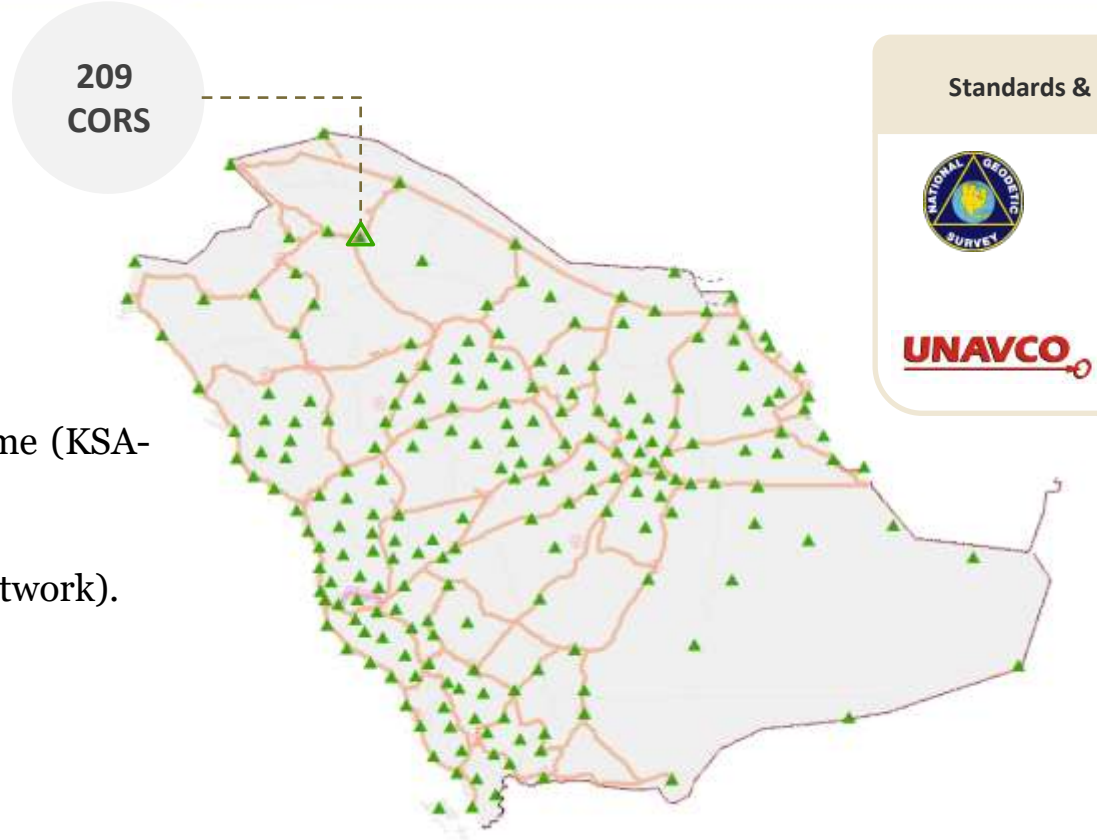


Roof Type KSA-CORS

Data Center

Standards

KSA-CORS Network Objectives



Standards & Specs. Used

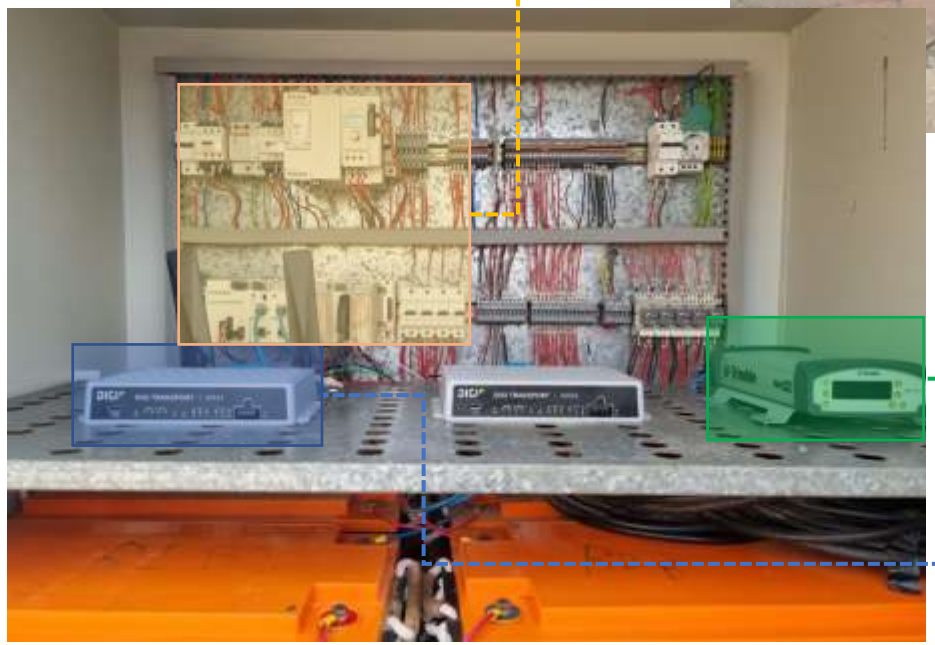
➢ OBJECTIVE

- **Reference Frame**
  - Define and maintain a kingdom-wide Geodetic Reference Frame (KSA-GRF17).
  - Study Arabian plate motion.
  - Collocate with other national networks (tide gauge & vertical network).
- **Provision of Services in KSA-GRF17**
  - NRTK, RTK, DGNSS,
  - Online Post Processing,
  - Raw GNSS files.
- **Promote KSA-GRF17 as the common reference frames for the Kingdom**

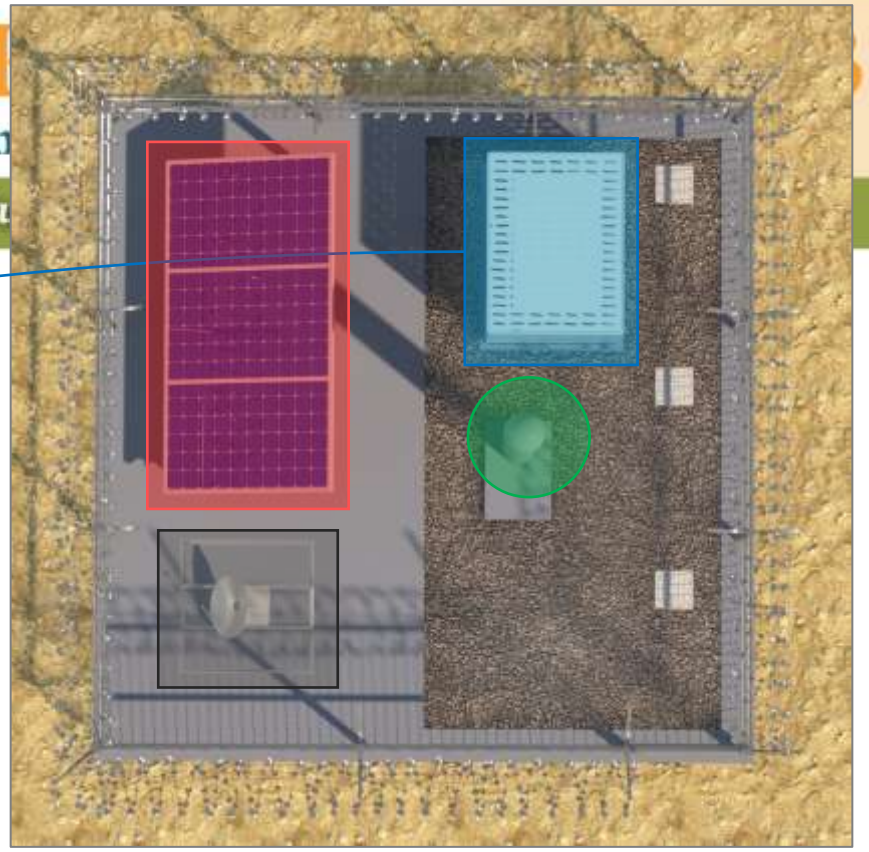
KSA-CORS Network Infrastructure

➢ Station Design

- State of the art geodetic equipment (multi-constellation)
- High robustness of the stations
  - Dual power system
  - Dual communications
  - Environment protected
  - State of health parameters motoring
- Monumentation
  - Soil investigation prior to monumentation
  - Geodynamic type for ground stations
- Stations fully compliant with best international standards (IGS, UNAVCO, NGS…)

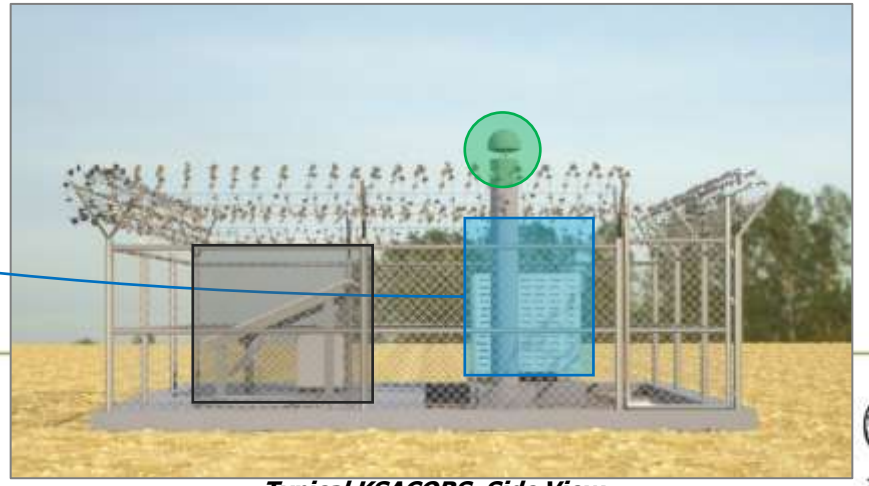


KSA-CORS Network Infrastructure



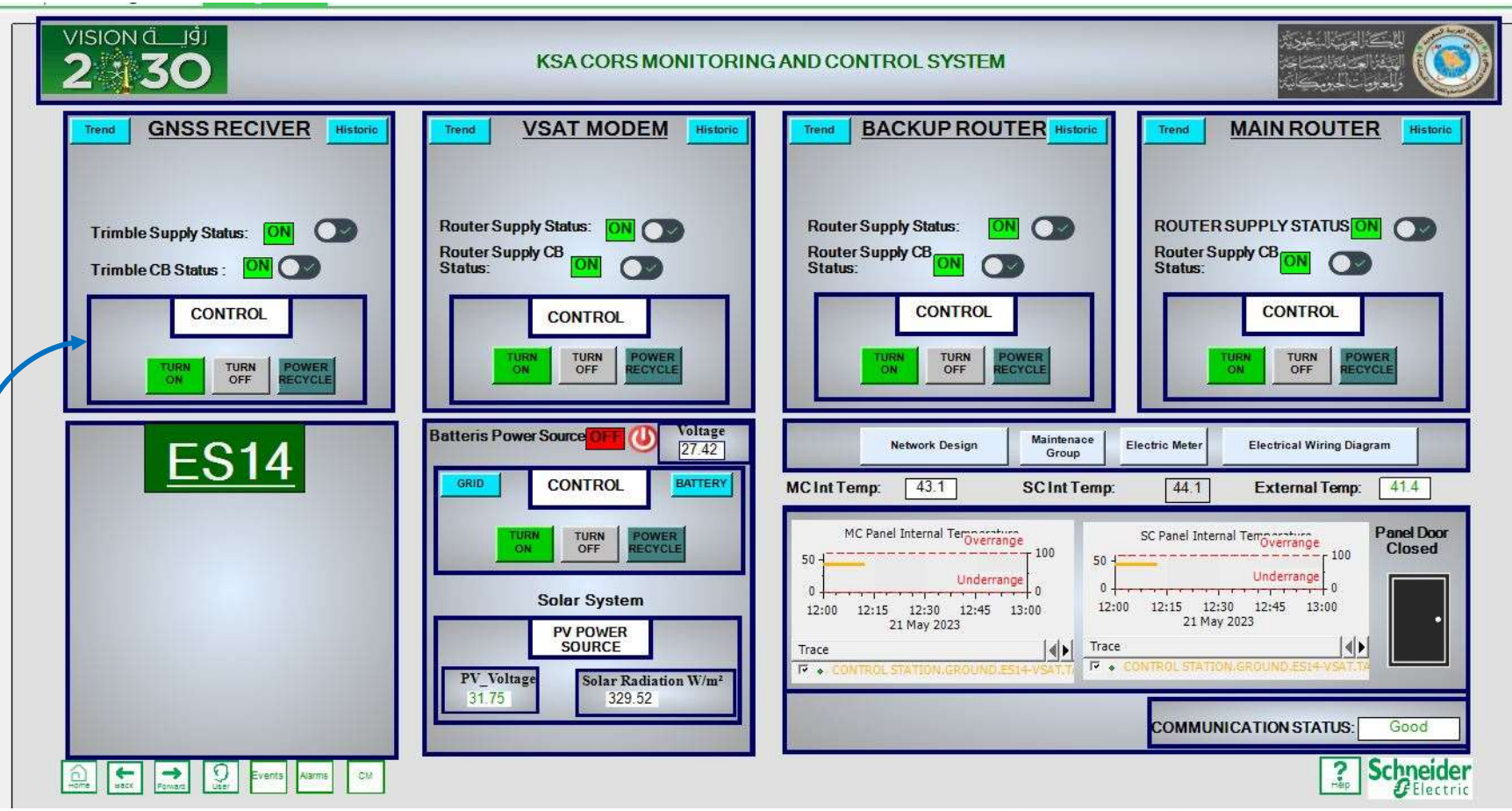
Typical KSACORS Plan View

Typical KSACORS Cabinet Component's



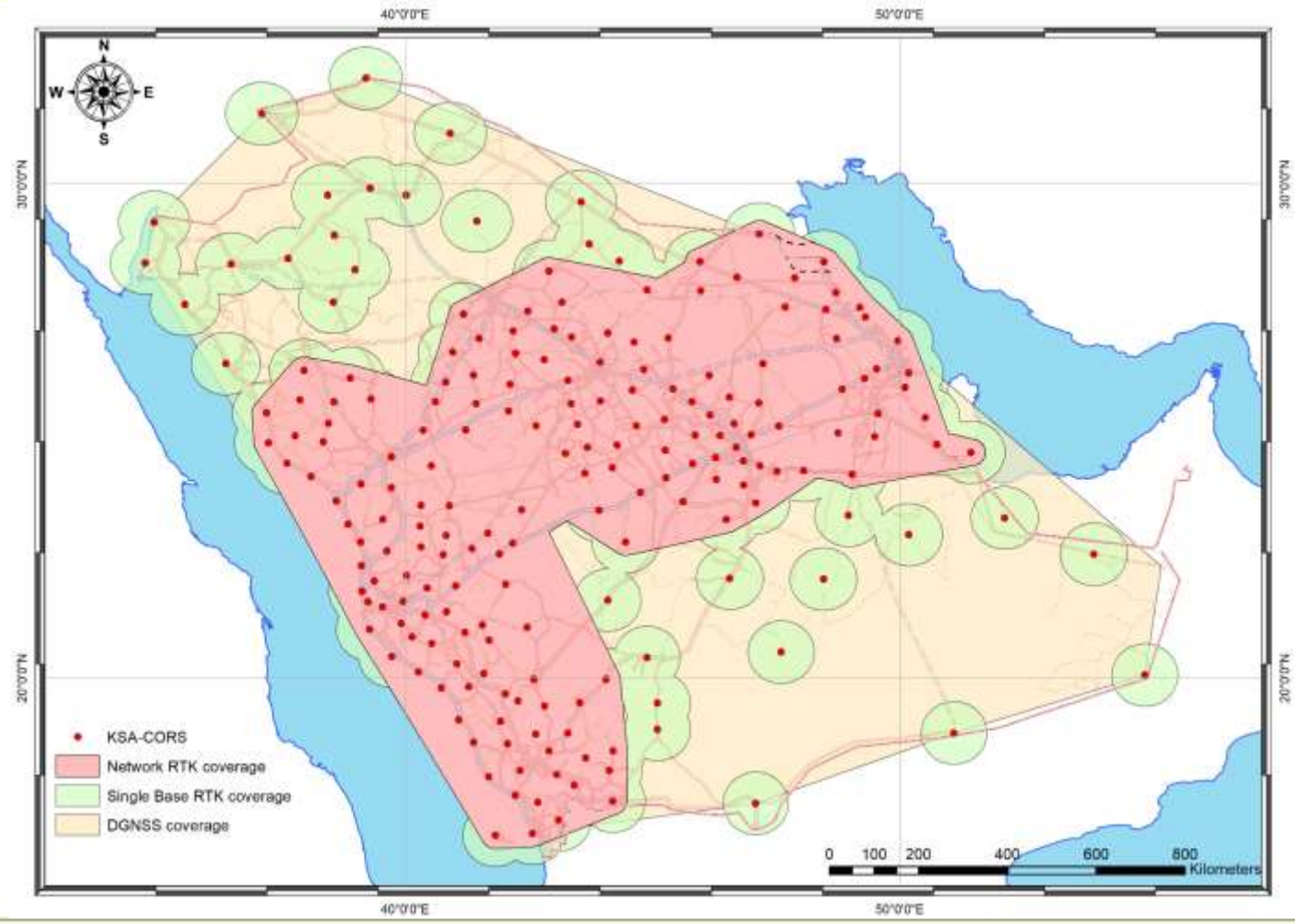
Typical KSACORS Side View

GeoSCADA Monitoring & Remote Control System



KSA-CORS Real-Time Services

Solution	Accuracy
Network RTK	1 – 3 cm
Single Base RTK	1 – 4 cm Depending on rover distance to the nearest KSA-CORS
DGNSS	Decimeter Level



KSA-CORS Network Performance

Result of testing. KSA-GRF17

- Differences between measurement coordinates and coordinates from catalog

$$\Delta = X^{(RTK)} - X^{(Catalog)}$$

Standard deviation: $$std = \sqrt{\frac{\sum(\Delta - \bar{\Delta})^2}{n-1}}$$

Standard Error: $$SE = \frac{std}{\sqrt{n}}$$

Statistical characteristics of residuals

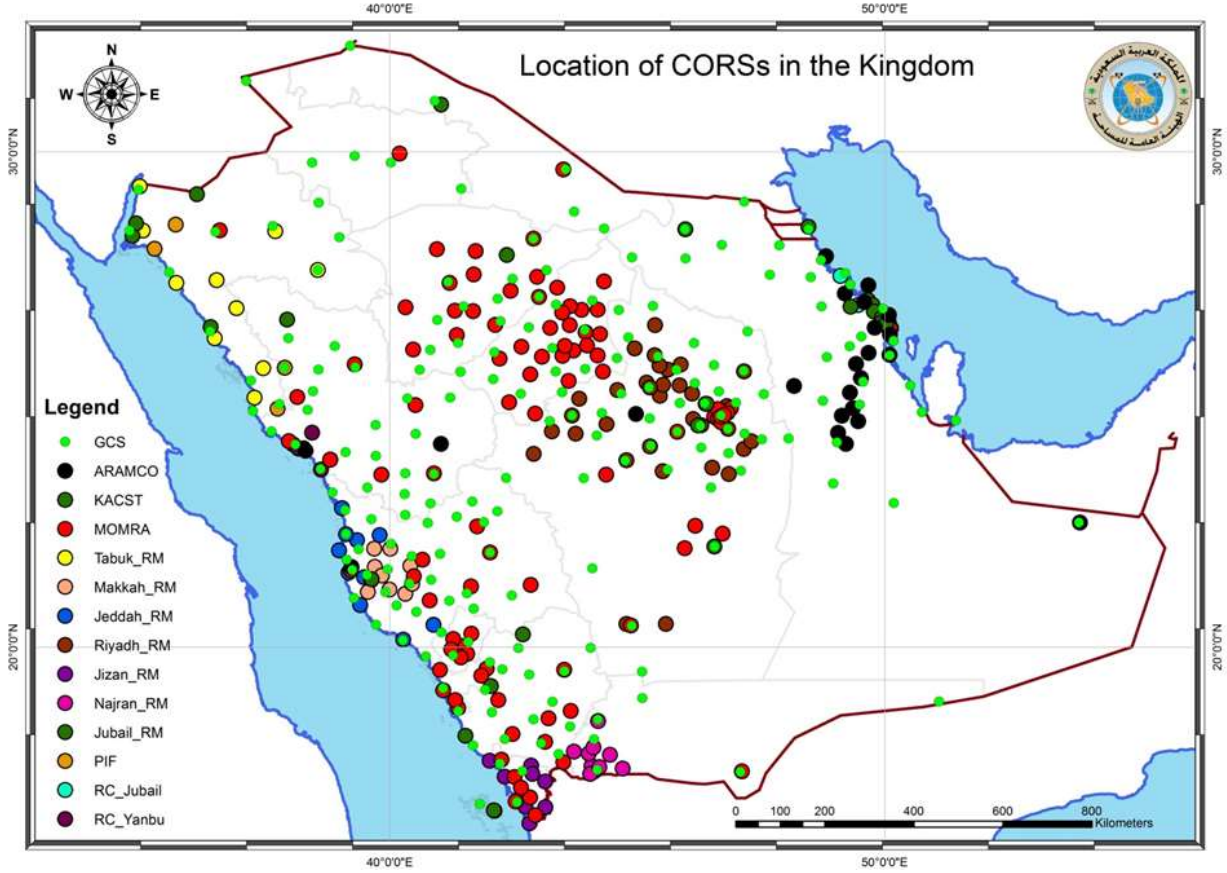
Statistics	East, m	North, m	Height, m
mean	0.006	0.001	0.015
std	0.010	0.008	0.032
mean + 3std	0.037	0.026	0.110
max	0.029	0.021	0.064
min	-0.015	-0.022	-0.071
mean - 3std	-0.024	-0.023	-0.080
SE	0.002	0.002	0.006

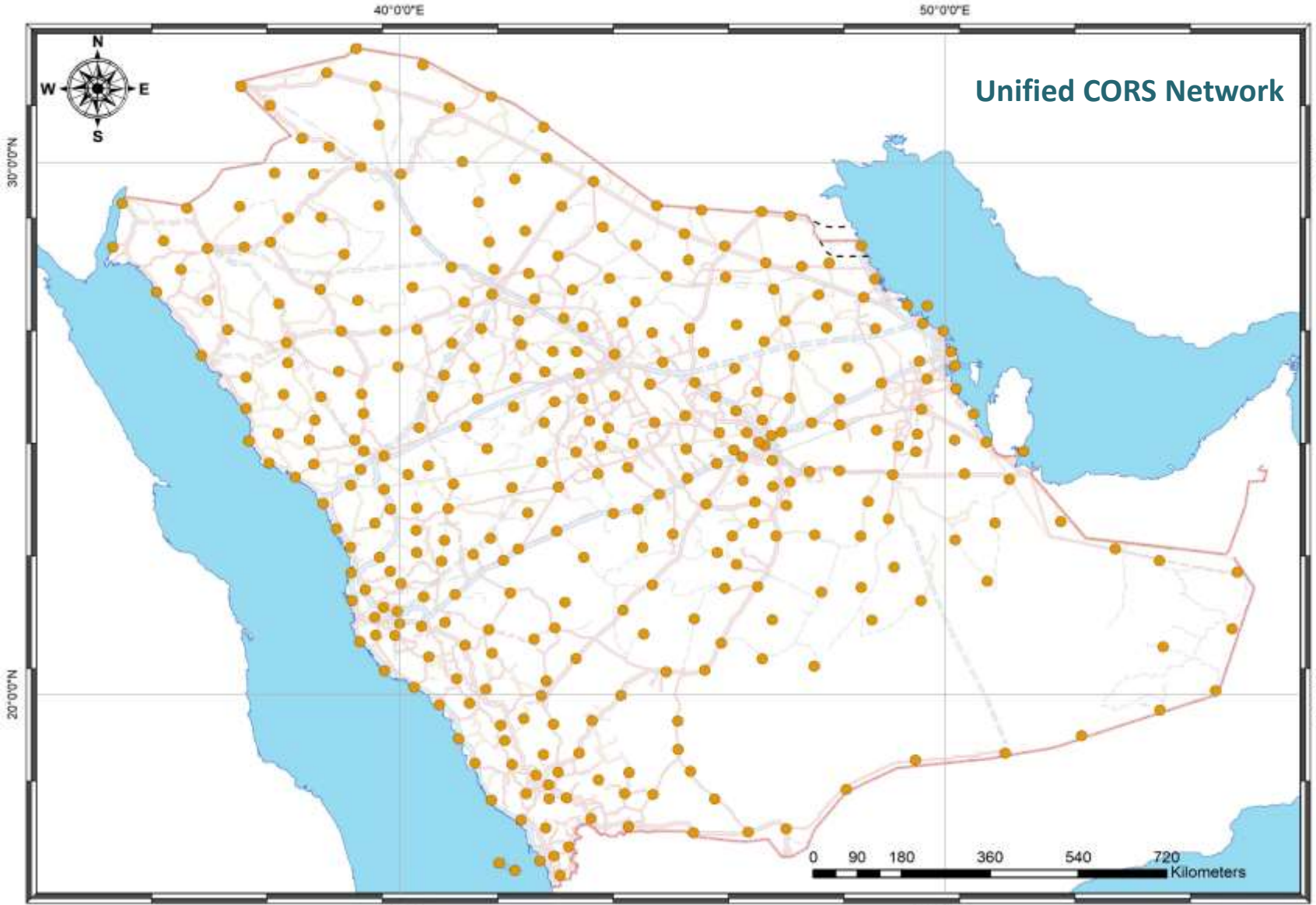
Application KSA-CORS Network

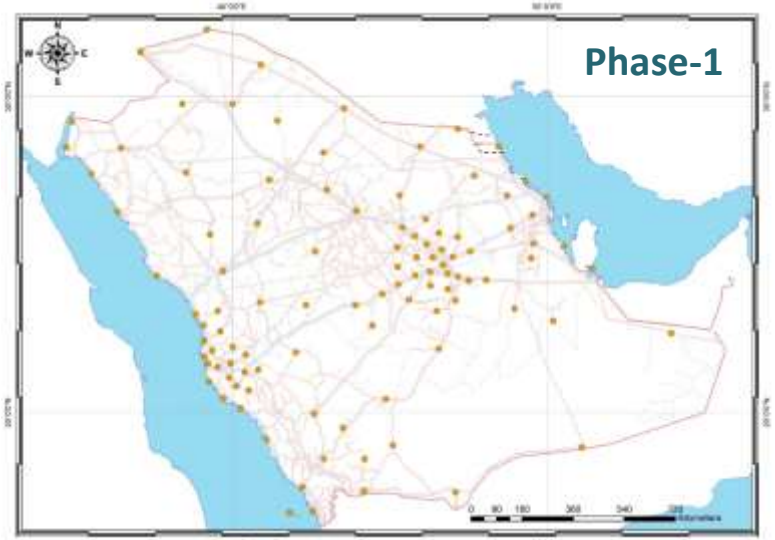
Current Challenges

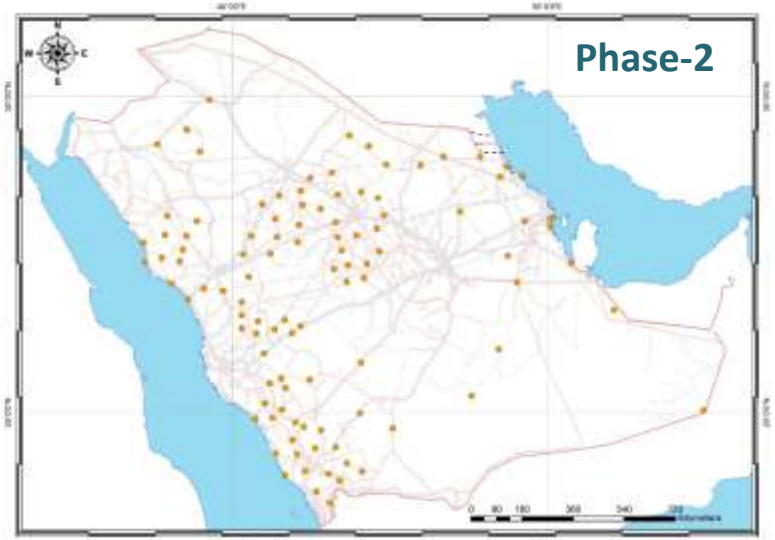
Duplication of Governmental-owned CORS networks

The operation and maintenance of these CORS networks has led to duplicated infrastructure, over-investment, inconsistent data and real-time service coverage, constraints on user access, limited quality control, operational expenditure and wastage on the Kingdom's budget.




Unified CORS Network
40°0'0"E
50°0'0"E
30°0'0"N
20°0'0"N
N
W
E
S
0 90 180 360 540 720
Kilometers


Phase-1


Phase-2

Future Plans

- Implementing the unified network design.
- Unify the Geodetic Reference Frames within the Kingdom.
- Transition from Static to Dynamic Reference Frame
- Collocation with other networks:
  - Collocating GNSS CORS with Absolute gravity plus tide gauges.
  - Tie KSA-CORS network to National Vertical Network.
- Network Control Center Migration to cloud.
- Capacity building and workshops

Conclusion

- GCS is deploying a high quality CORS network providing:
  - Definition of the national reference frame
  - Observations for tectonics studies
  - Data to contribute to international reference frames
  - Real time positioning services provision

Modern infrastructure for an easy access to the KSA-GRF

Thank you

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