



Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA

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Analysis of Implementation Data from a low-cost ambulance management System

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Existing System Architecture

<https://geo.thws.de/en/labore/labor-fuer-photogrammetrie-und-fernerkundung/projekte/effective-ambulance-management-system/>

Introduction

- The use of (GIS) is critical in resolving the problem of ambulance relocation
- EMS systems studied by operations research scientists, EMS planners, and healthcare practitioners due to the **importance and sensitivity of decision-making in the EMS field** (Aringhieri et al., 2017).
- Research in Ghana Okyere et al. (2022), Agbenyo et al (2017), Adamtey et al.(2015)





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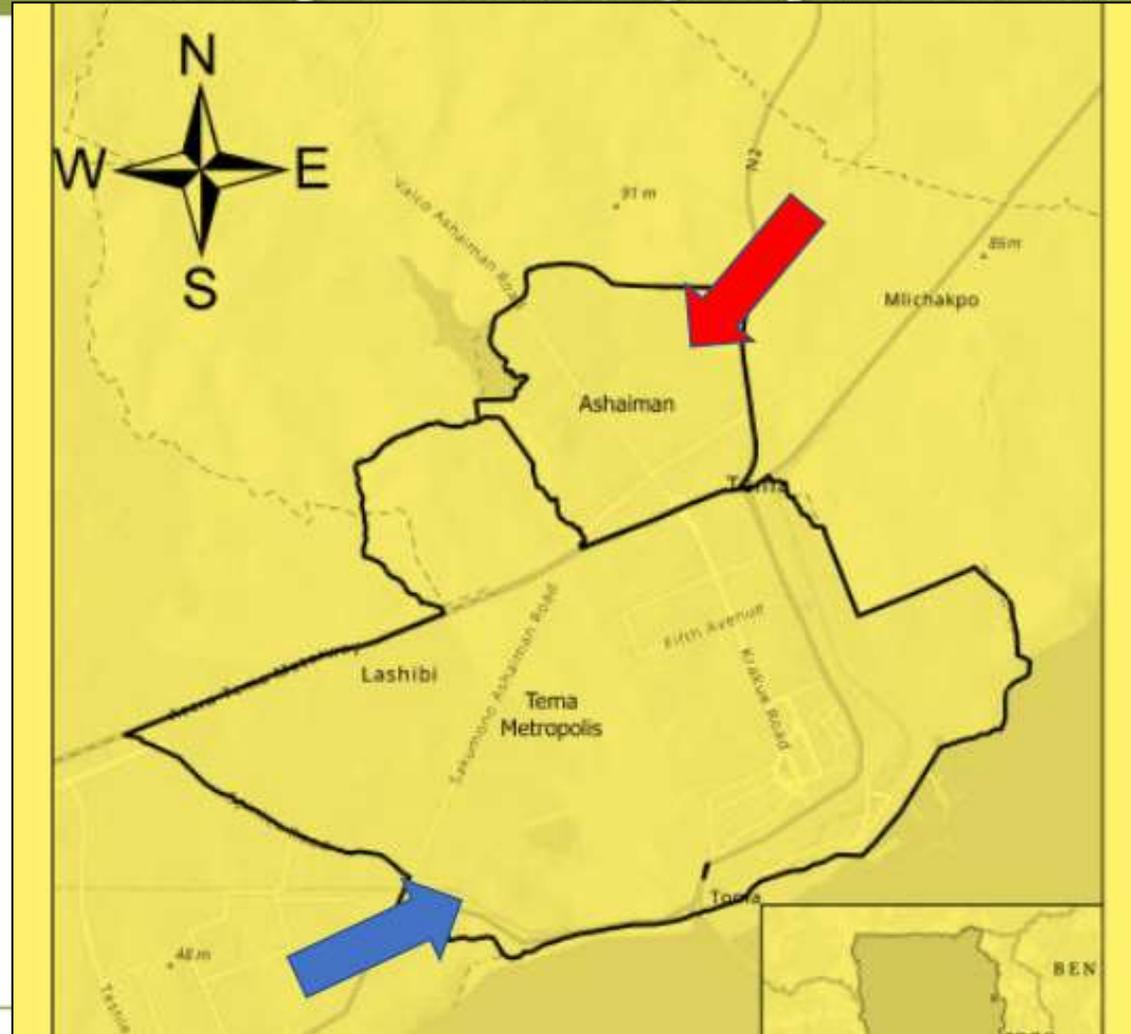
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161,612

235,000

Population



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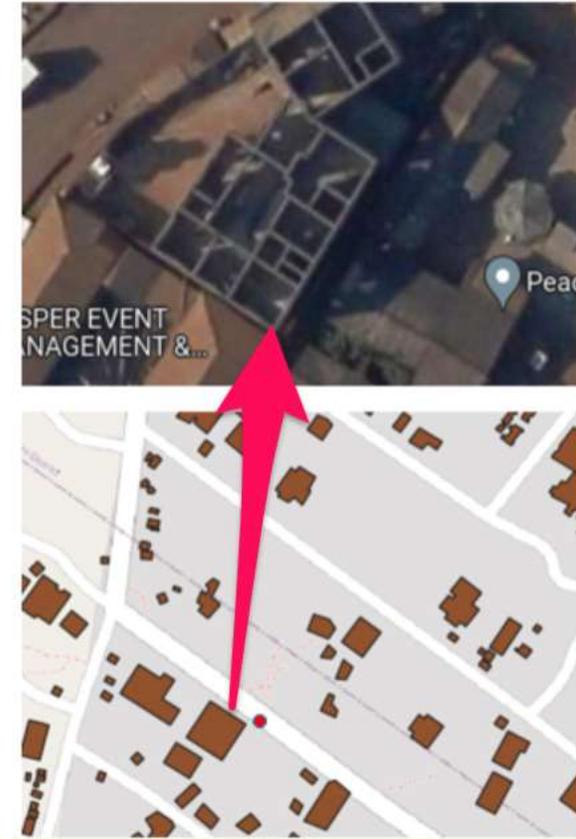
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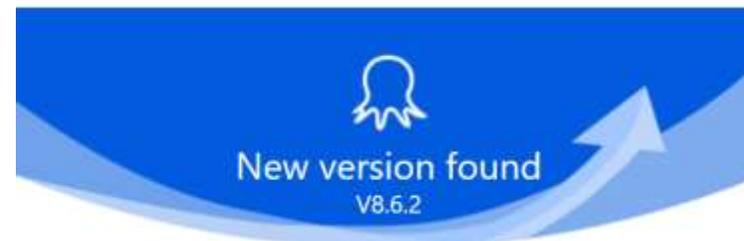
Methods

- Demand points represented by building centroids from OpenStreetMap
- Assumption that all buildings captured by OSM are inhabited
- Ambulances Routes collected from
- Global Navigation Satellite System (GNSS)

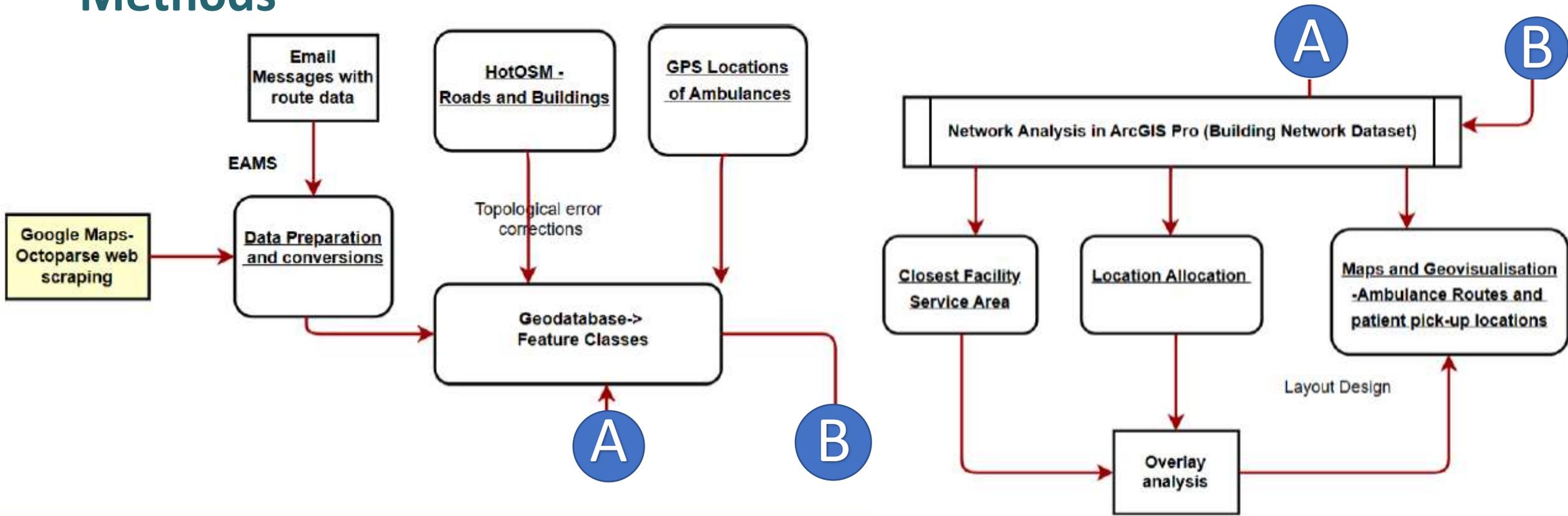


Methods

- Spatial data scraping from Google Maps using OctoParse
- Extraction query focused on clinics, hospitals, and diagnostic centers
- OSM road network data used, cleaned for topological errors



Methods



Results

- Service Areas
- Location Allocation

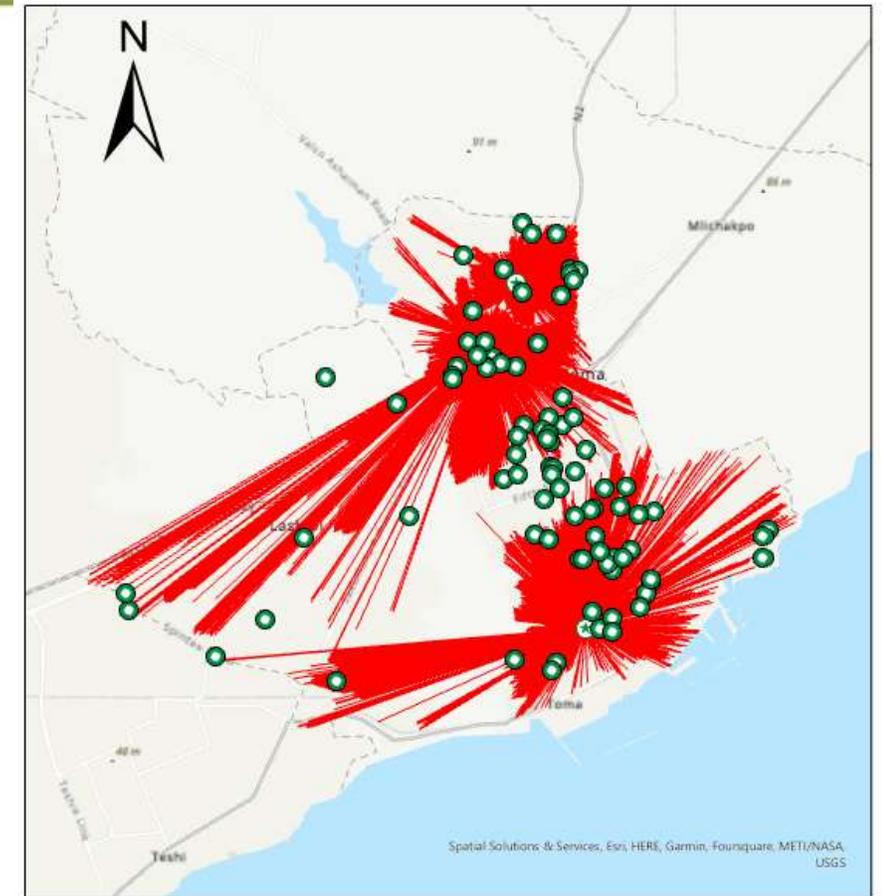
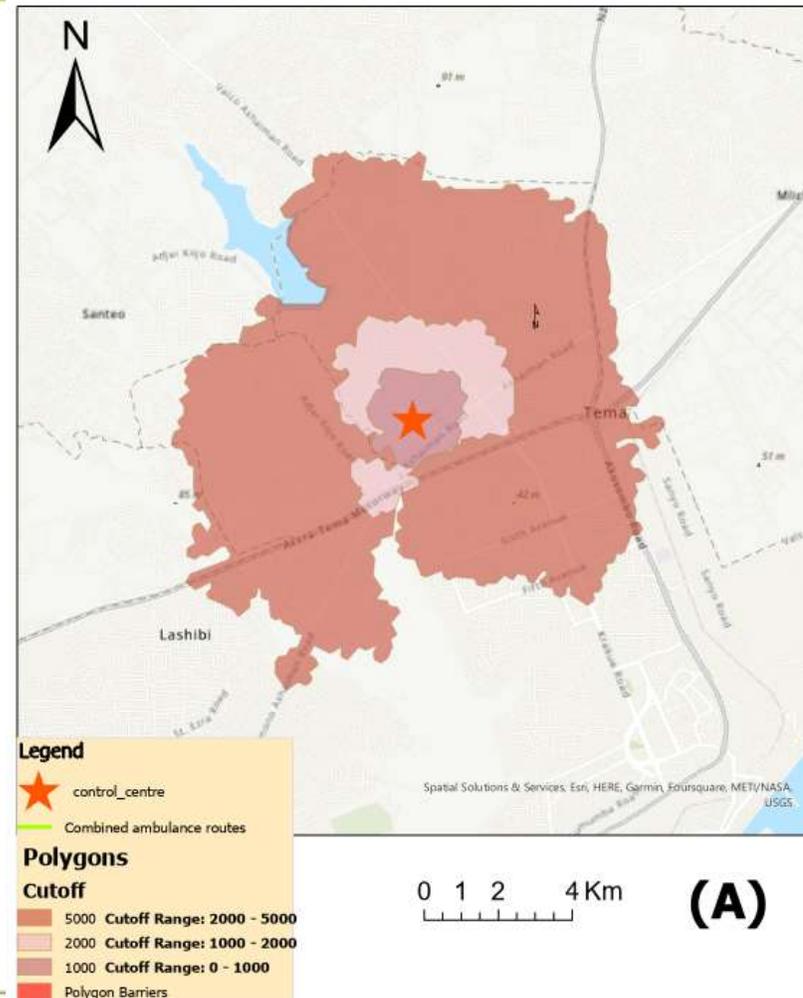


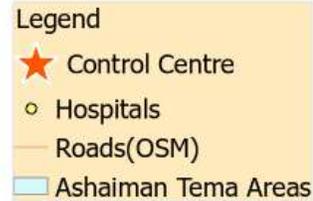
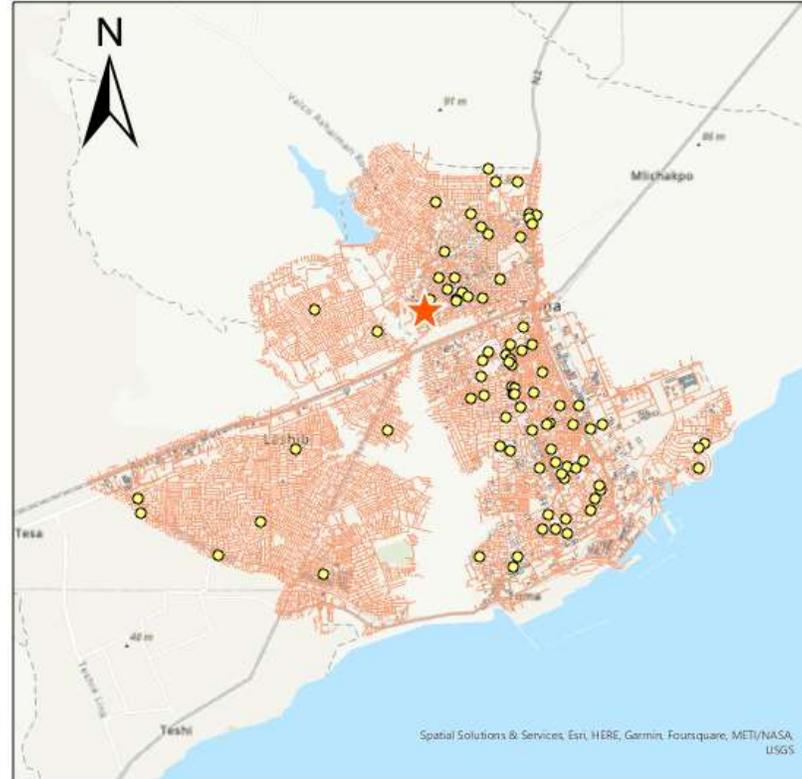
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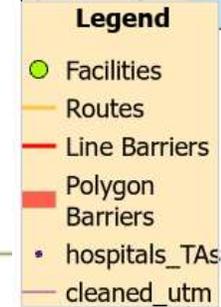
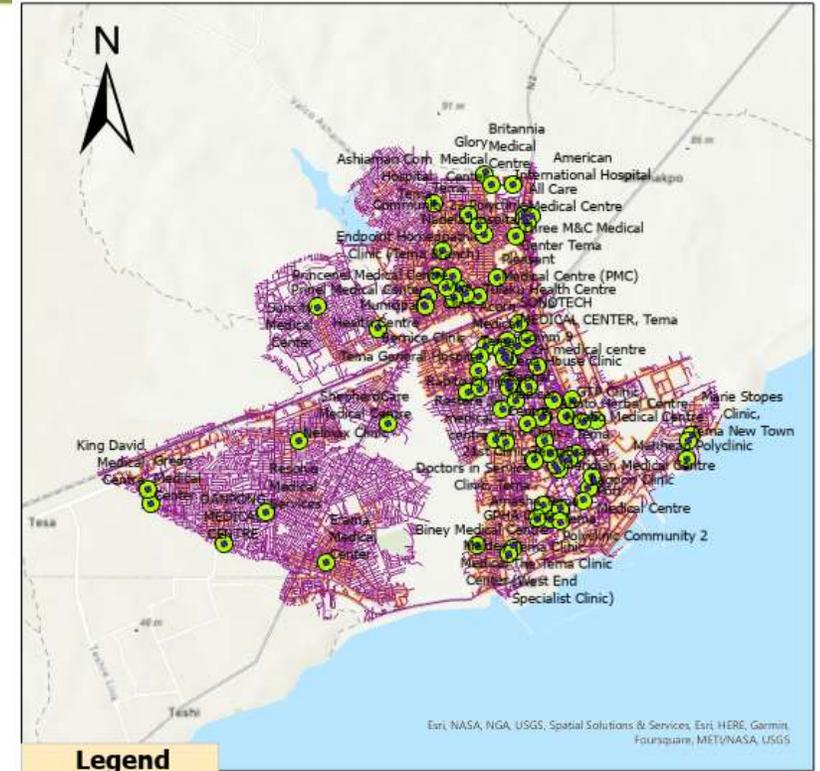
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Results

- Health Facilities
- Location Allocation



(C)



(D)

Conclusion and Recommendation

- Real ambulance route overlay reveals insights
- Need for more concise data in closest facility, service areas, and location-allocation problems
- Facility locations tend to cluster around patient destinations
- Ambulance route determined by shortest route algorithm

Conclusion and Recommendation

- Few ambulances serve over 30,000 demand nodes (households)
- Allocation analysis depends on parameters and changes with emergency cases
- Service areas with travel distances of 1 to 3 kilometers have <5-minute travel time
- Optimal paths found using Google Maps traffic-generated network routes

Conclusion and Recommendation

- Network connections affect closest facility output routes- bad roads
- Resolve Medical Services disconnected
- Lack of mapping by
- OSM and
- availability as a
- web map service



Conclusion and Recommendation

- Traccar software provides geofence-based ambulance availability but not programmatically
- Commercial GIS software (ArcGIS) used with associated costs
- Need to compare results with network analysis plugin in QGIS interface

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