

# Malawi Automatic Weather Stations data exchange



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## Manned stations on GTS

- 23 stations making 2 observations per day (few of them 4 obs/day)
- Very few data where received by NWP Centres.
- Some GTS problems resolved
- AWS on OSCAR → more back dots
- More data received, but
  - Most of the stations are not making pressure observation
  - Number of observations per day are not enough and not regular



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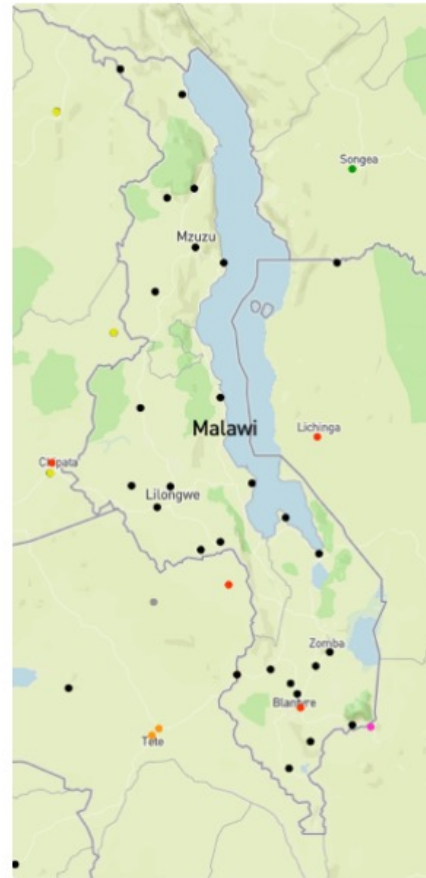


Fig.1 2021/02

- a lack of data
- one observation only

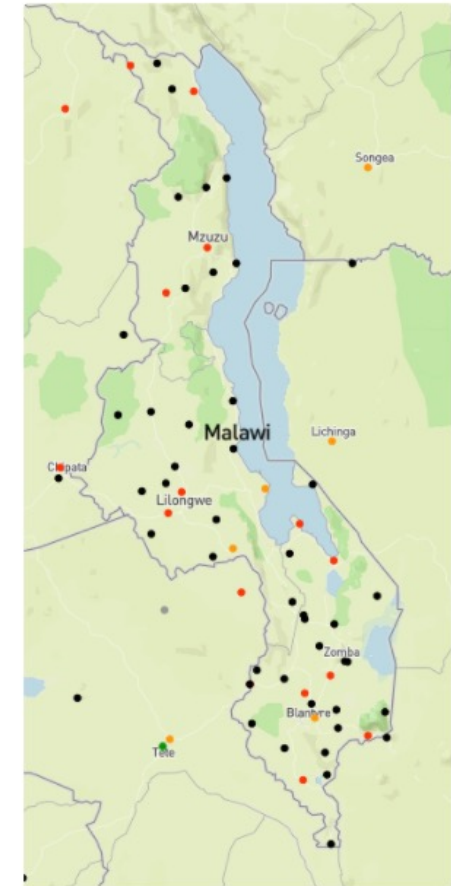


Fig. 2 2021/05

- a lack of data
- one observation only
- two observations

# Problem statement

Malawi NMHS manages 44 Campbell Scientific automatic weather stations (AWS), providing data through a GSM connection and internet.

These are the issues related to the AWS data:

- several stations are affected by transmission problems because their SIM card has been disabled or because the GSM signal is too weak
- AWS data are used only locally and not exchanged internationally via GTS
- Campbell Scientific software cannot produce BUFR. The WIGOS station identifier (WSI) cannot be encoded in SYNOP, therefore BUFR is required
- data are received on a PC in Blantyre in DCCMS headquarters, which constitute a single point of failure and is not sufficient to guarantee the required continuity and resilience of the transmission



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# Project objectives

- Continuous and reliable provision of hourly real-time data from 44 stations to WMO NWP Centers in BUFR format through GTS and WIS 2.0 Message Queuing Protocols.
- Optimization of the acquisition system for cloud services for sustainability purposes.
- Development of a turn-key solution to be delivered to other Countries.



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# Project team

Name	Agency
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Mr Amos D MTONYA	Department of Climate Change & Meteorological Services, Malawi
Mr Hussein MILANZI	Department of Climate Change & Meteorological Services, Malawi
Ms Christa FERREIRA	South African Weather Service

Name	Company
Isak Lombard	Netsys
Johan Visagie	Campbell Scientific
Mauritz de Beer	Campbell Scientific
Rob Costello	Amazon
Philippe Jegou	Amazon

## WMO Secretariat

Enrico Fucile

Timo Proescholdt

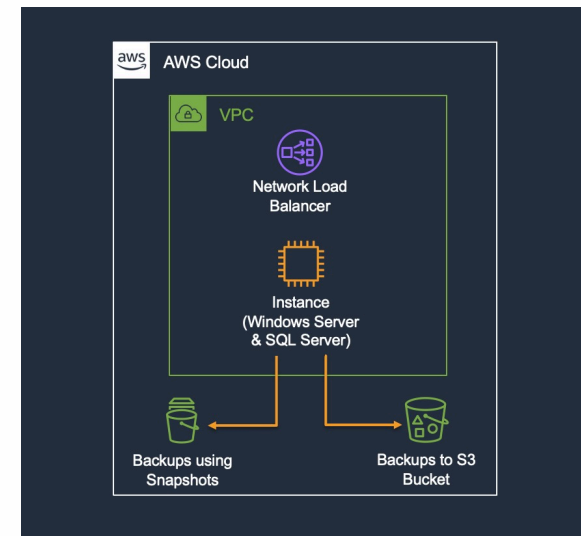
Xiaoxia Chen



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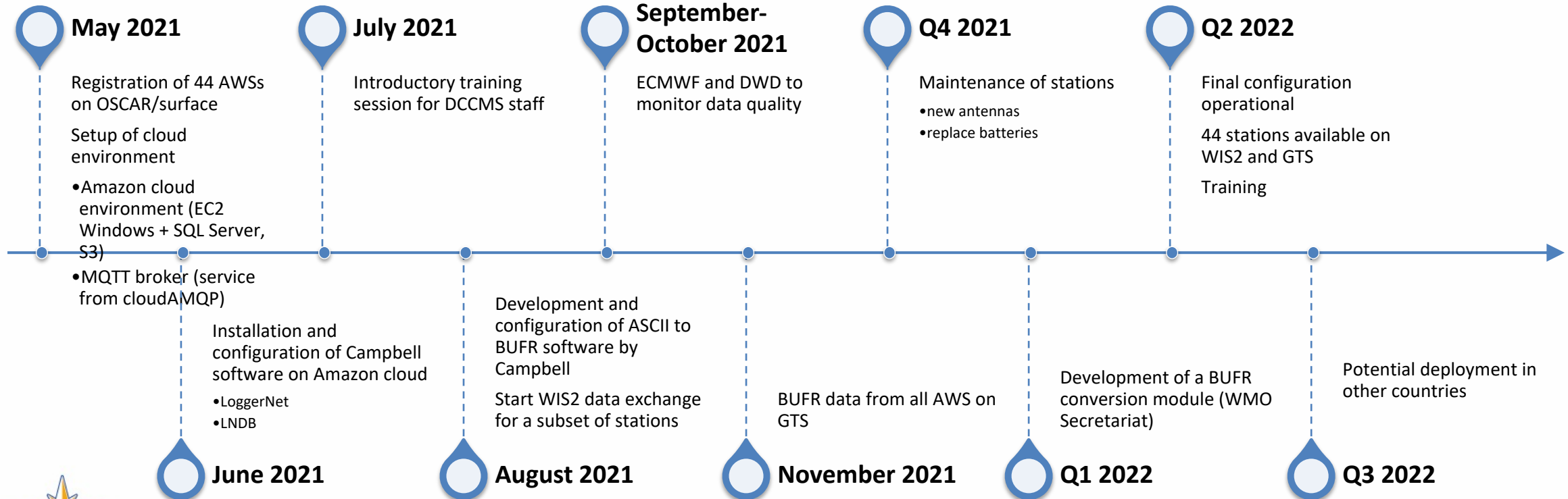
# Project costs

- Amazon services one year around \$10K (**first year provided for free by Amazon**)
- Implementation of Campbell Sci. software on Amazon cloud service provided at no cost by Campbell Sci.
- Implementation of BUFR production provided by Campbell Sci. at no cost.
- Cost of WIS2 type transmission to be determined (rough estimate **\$5000/year**) to replace GTS in the longer term.
- Cost of improving GSM reception around **\$6000**
- Training for IT staff in Malawi to be provided by the Secretariat and Amazon (no cost for DCCMS Malawi)



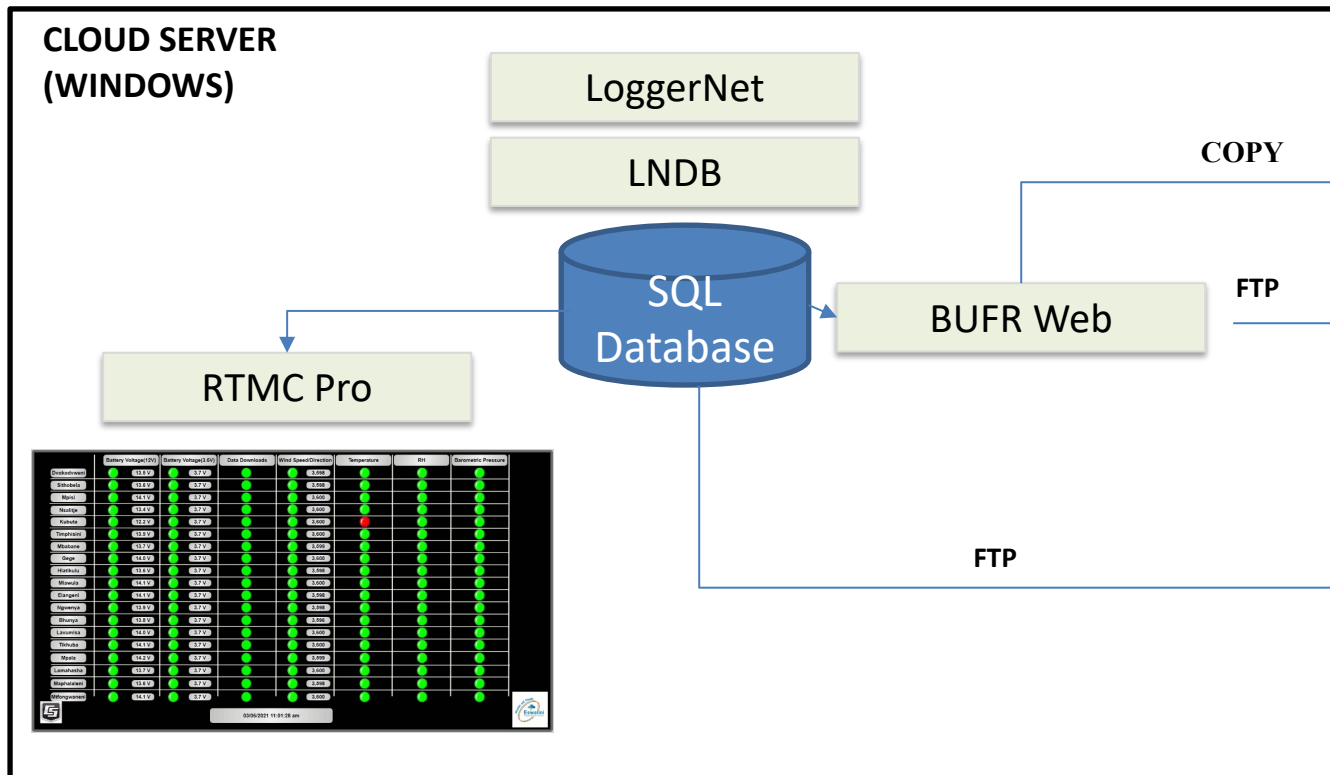
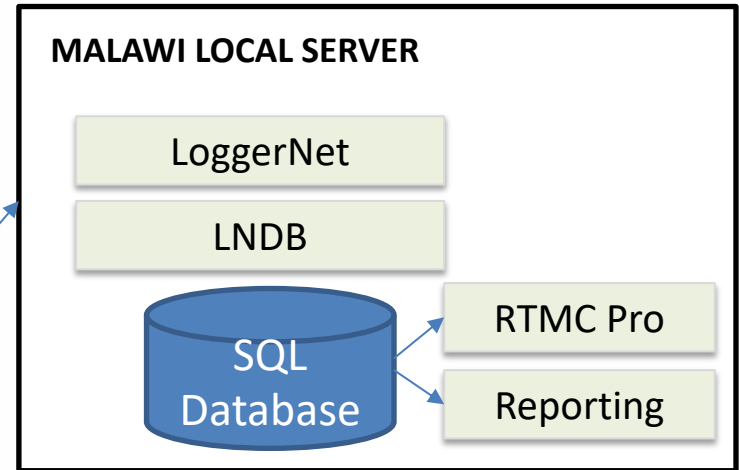
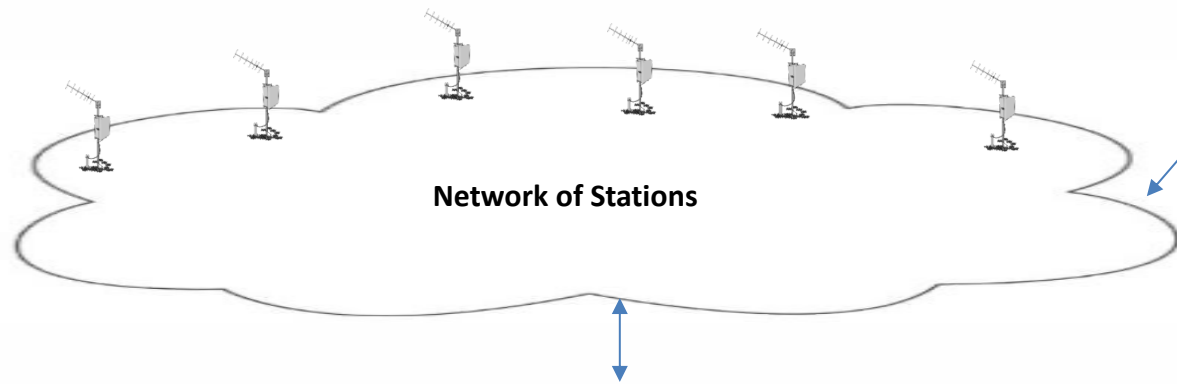
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# Project plan



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# Data Architecture

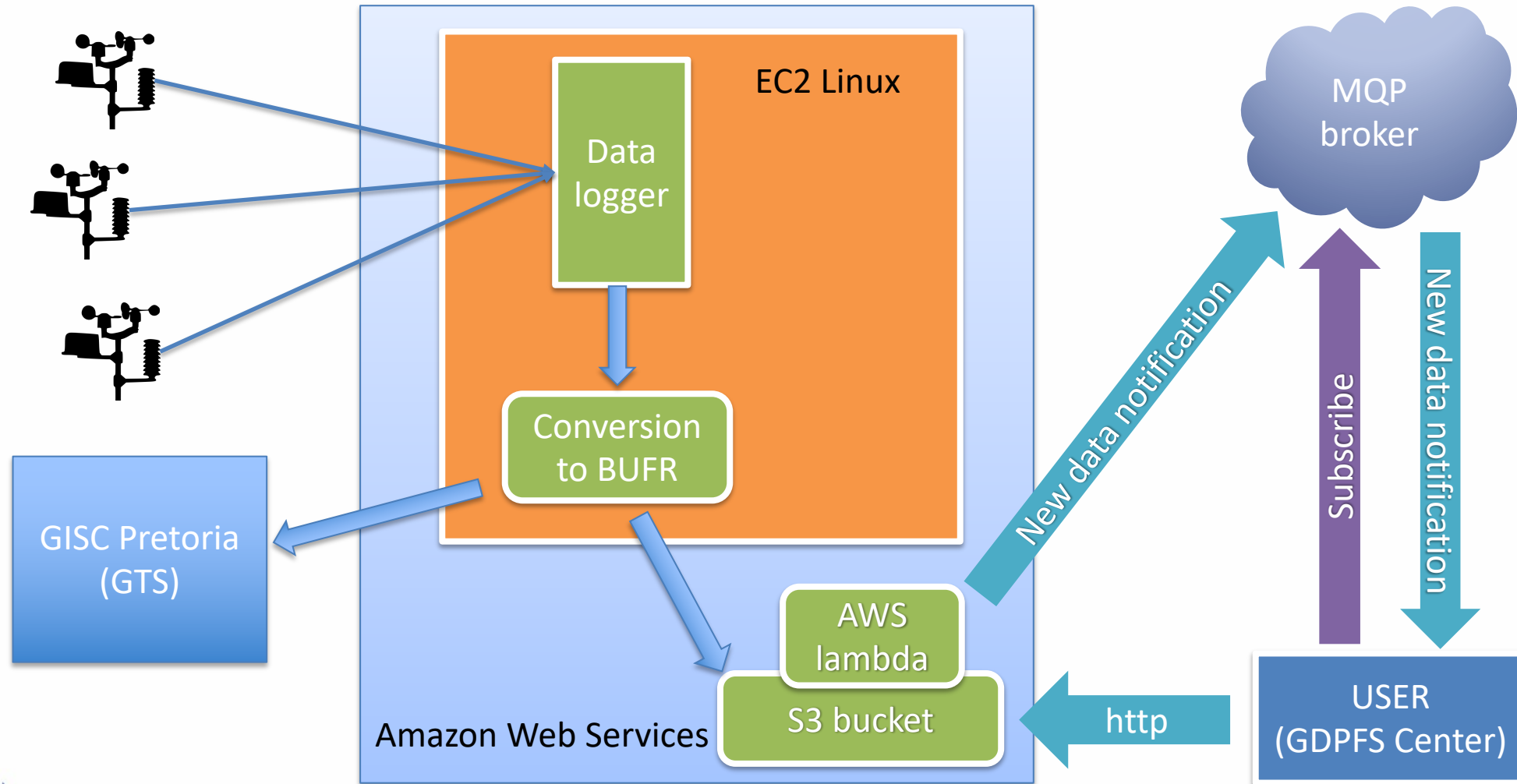


Station	Battery Voltage(V)	Supply Voltage(V)	Data Downloads	Wind Speed(M/s)	Temperature	SW	Comms Pressure
Chitwan	12.8V	12.8V	●	0.0m/s	22.0C	●	●
Shabali	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Nari	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Thanga	12.8V	12.8V	●	0.0m/s	22.0C	●	●
Kalaka	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Thapaha	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Mitaha	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Chitwan	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Thapaha	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Wanaka	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Chitwan	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Nyansa	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Chitwan	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Lumaka	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Thapaha	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Nari	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Chitwan	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Thapaha	12.7V	12.7V	●	0.0m/s	22.0C	●	●
Chitwan	12.7V	12.7V	●	0.0m/s	22.0C	●	●



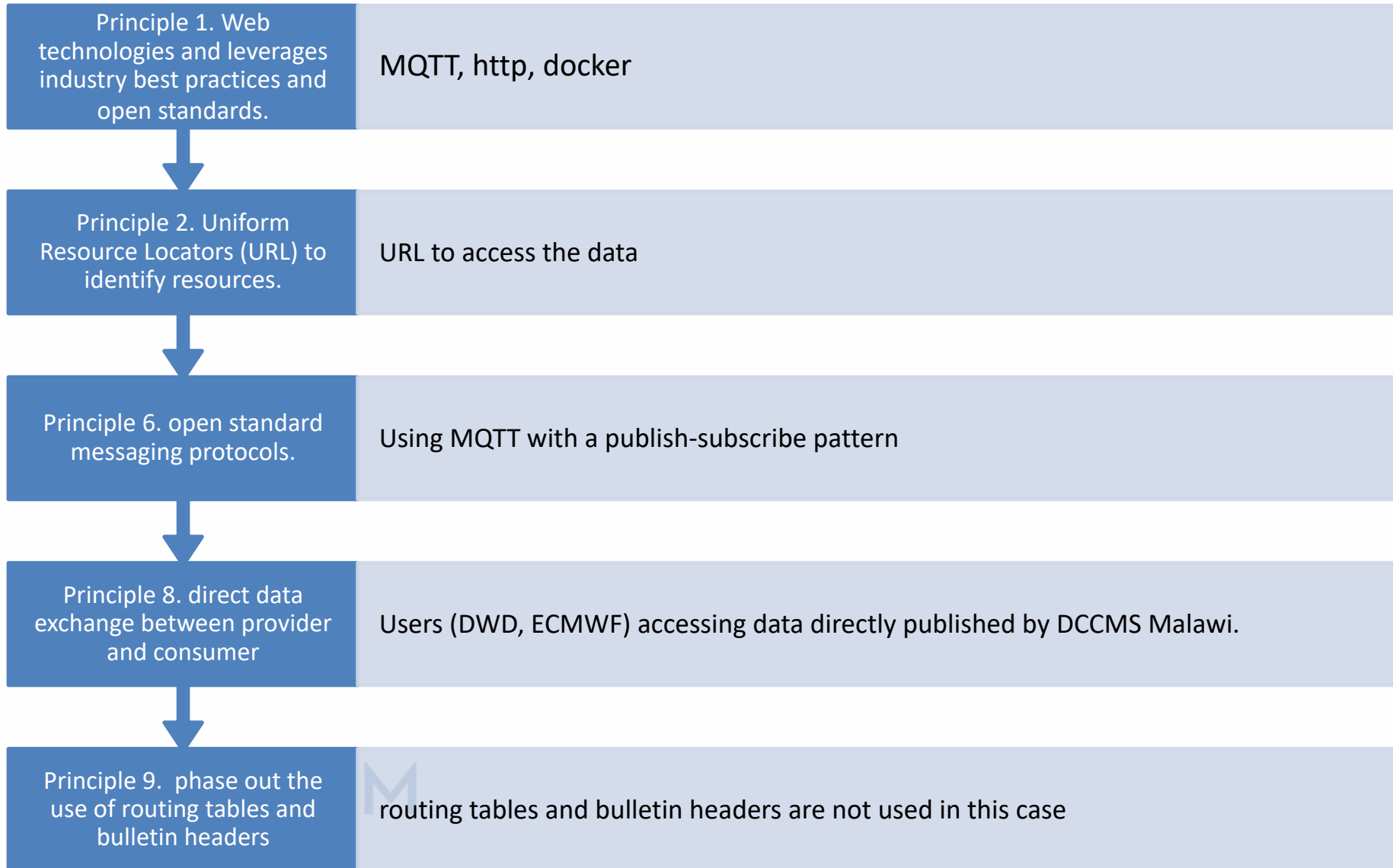


# Final configuration



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# WIS 2 Principles in the project



# Project data standards

- BUFR to be exchanged on the GTS and WIS2
- Conversion from ASCII format to BUFR to be implemented using ecCodes and provided as a python script and in a docker container.
- Training on BUFR will be provided by the Secretariat to DCCMS Malawi.



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# Project metadata standards

- No search metadata uses
- Data will be published on WIS as all GTS data



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# Data discovery

- No data discovery implemented in the project



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# Data exchange

- Exchange of BUFR data through GTS and WIS2 protocols.



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# Input to WIS2

- Important to foster cloud services to provide turn-key solutions.
- BUFR presents a barrier that is extremely difficult to address. More tools and training needed to support BUFR data exchange.
- Difficulties are encountered in data exchange from the station to the acquisition centre at national level. Support to improve national exchange is required.
- Internet availability and costs can be a limitation in LDCs.
- Observing station manufacturers provide closed solutions to access data from the stations. Open standards would be helpful at that level.



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Thank you  
Merci

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