

A SMART SYSTEM FRAMEWORK ENABLING AN INNOVATIVE WEATHER AWARENESS SYSTEM FOR AIRPORTS AND BEYOND

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WSN16

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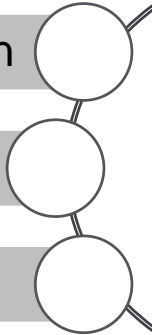




BUILDING A NEW ATM SYSTEM IN EUROPE

Single European Sky Air Traffic Management Research

European Commission



Eurocontrol

Industry

Budget of 2.1b€

~300 Projects

16 Work Packages



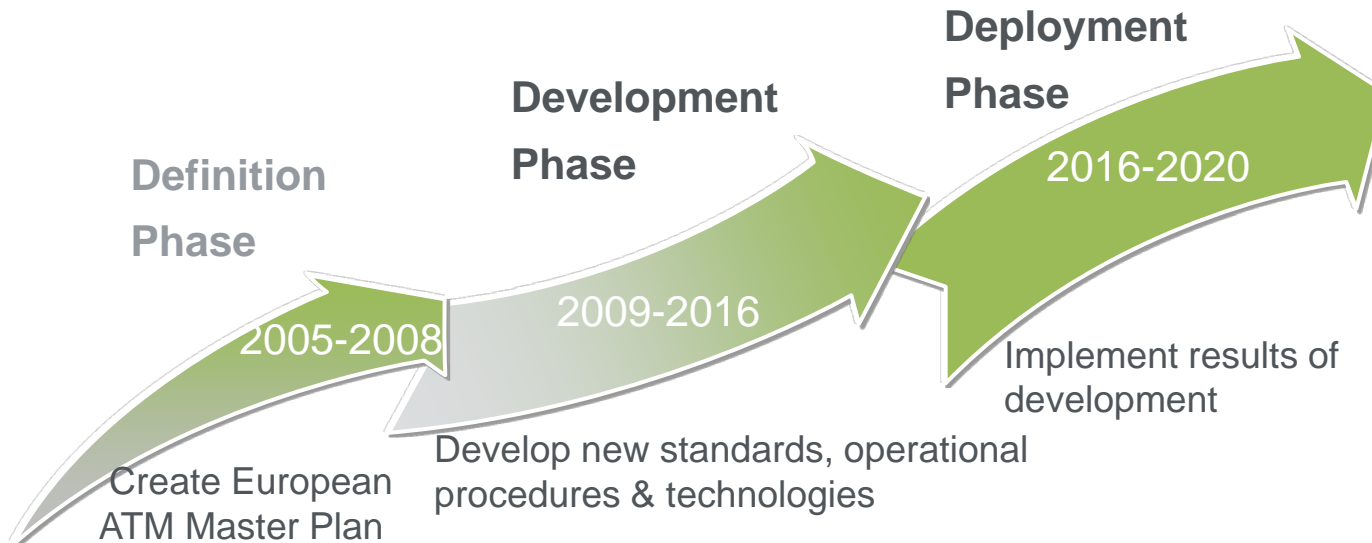
Overall Goals

Capacity Increasing

Improving Safety

Greener Sky

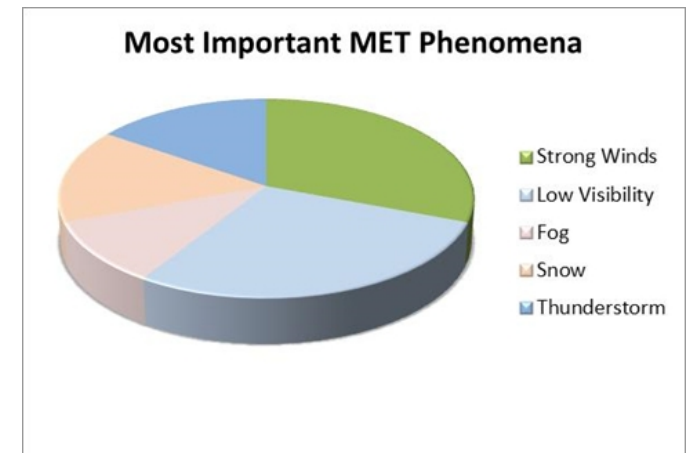
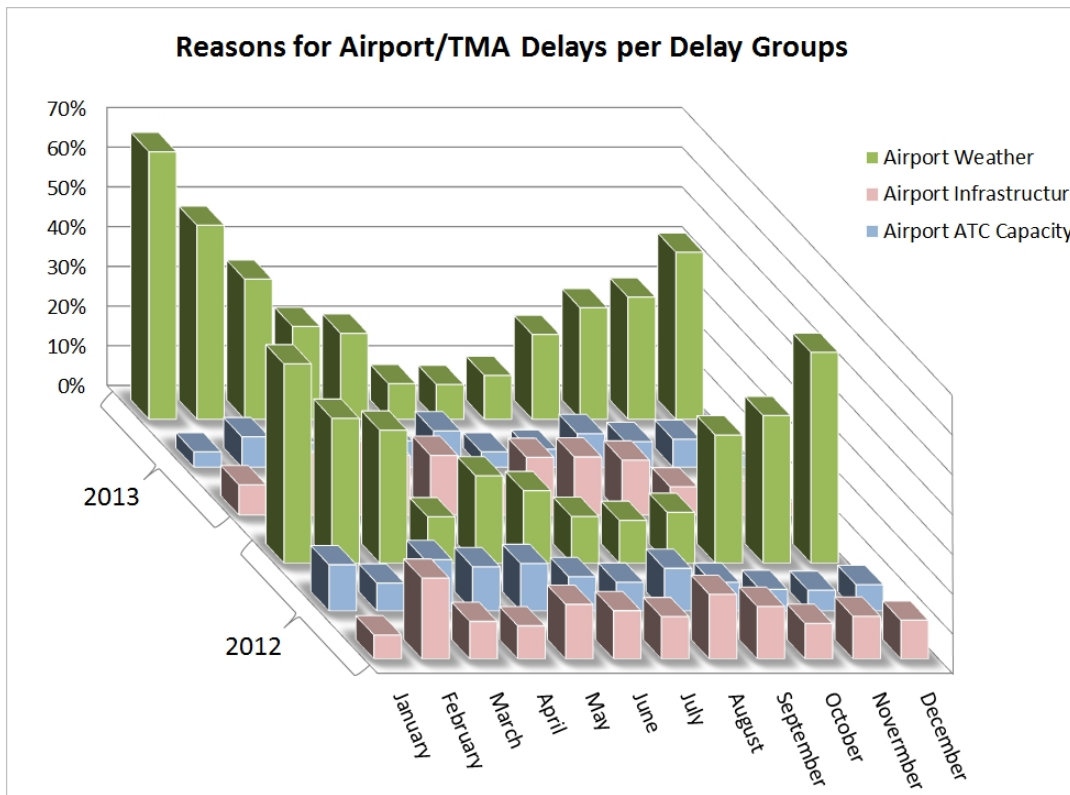
Cutting ATM Costs





WHY IS A NEW MET SYSTEM APPROACH NEEDED?

- MET plays a key role in aviation



For airport operations, Weather is the **main** source for delays!



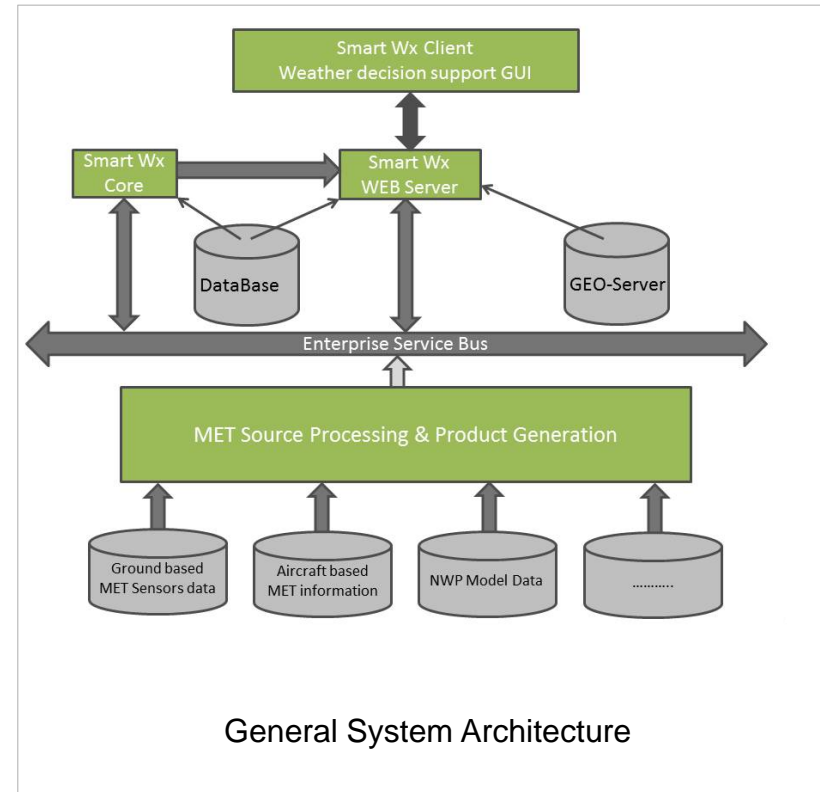
WHY IS A NEW SYSTEM APPROACH NEEDED (2)?

- **Needs** to reduce the weather impact on ATM are identified:
 - **Improved** MET capabilities
 - Improved MET products in terms of accuracy, update rate and reliability
 - New MET products to serve all MET phenomena properly by using new MET Sensors capabilities
 - **Improved** MET data availability and provision
 - A services oriented approach guarantees access and tailor-made data for each Users (SWIM concept)
 - **Improved** MET Translation & Presentation
 - A tailor-made provision for a common understanding between Users
 - Enhanced MET Products and/or pure Alerts and Warnings presentation for a complete “MET-Picture” to support the decision making process

A SMART SYSTEM FRAMEWORK AS A SOLUTION

- Key Features of System Framework

- ❑ Flexibility of MET input
- ❑ Using Data Distribution Services (DDS) technology ensures a service oriented architecture
- ❑ Interoperability to the SESAR System Wide Information System (SWIM)
- ❑ A highly configurable web-based graphical interface
- ❑ Just a standard Browser is needed
- ❑ Using open source service Open Street Map / GeoServer for the geographical mapping
- ❑ Representation of MET from abstract to any details thanks to a multi layer structure





THE FIRST DEPLOYMENT INSIDE SESAR

- The Framework Set-up
 - ❑ AWOS Sensors (Yellow Markers)
 - 2 Ceilometers (Runway heads)
 - 3 Transmissiometers (Runway heads and middle)
 - 2 Anemometers (Runway heads, 10 m wind)
 - Thermometer (2 m temperature)
 - Pressure sensor
 - Humidity sensor
 - ❑ Raymetrics 3D-scanning Ceilometer
 - ❑ Leosphere Wind Cube 400S 3D scanning Doppler Lidar
 - ❑ Selex ES 50DX mobile polarimetric X-Band weather Radar
 - ❑ Selex ES RS3DP Compact Solid State polarimetric X-Band Radar
 - ❑ Axis Fish Eye Camera (M3027-PVE)
 - ❑ FLIR Infrared (IR) Camera (A315)
 - ❑ Nowcast Lightning Data
 - ❑ Numerical Weather Prediction Model (COSMO DE)

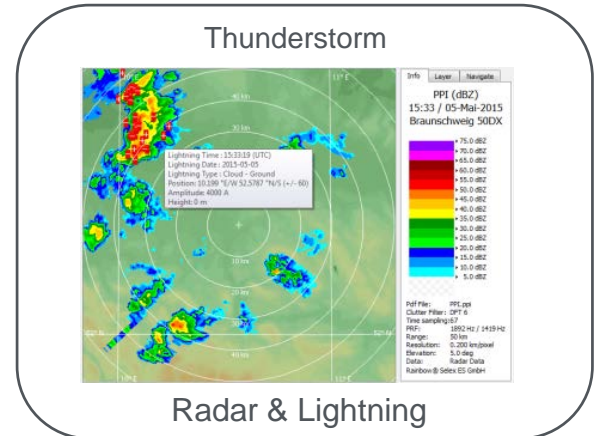
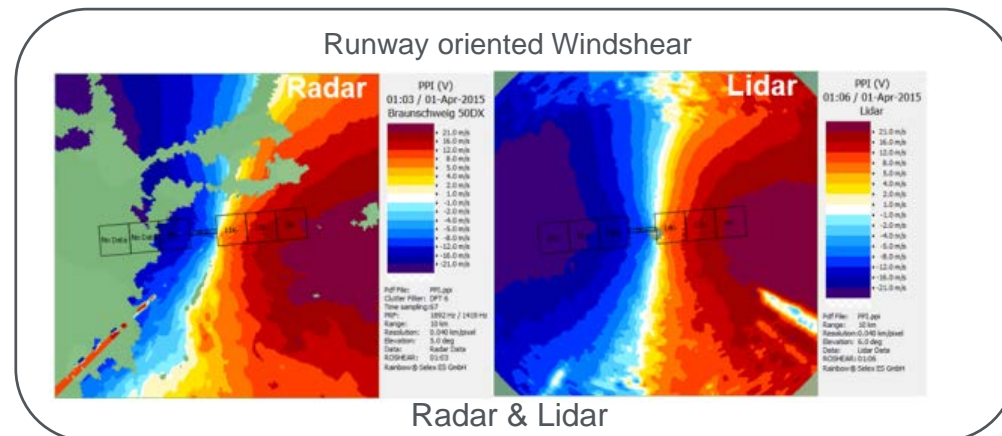
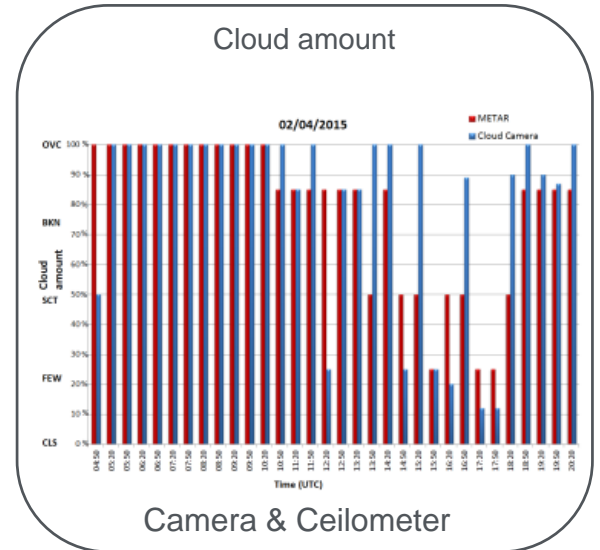
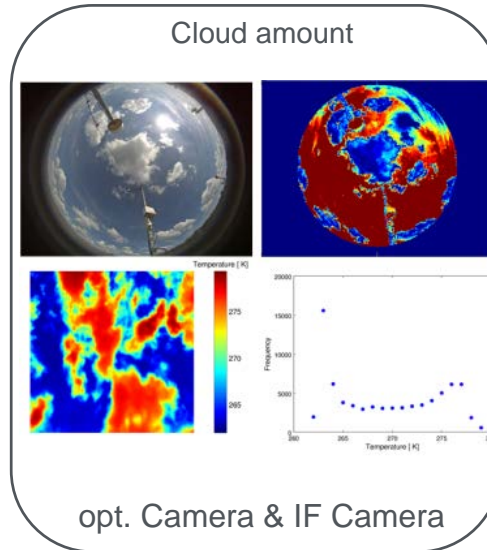
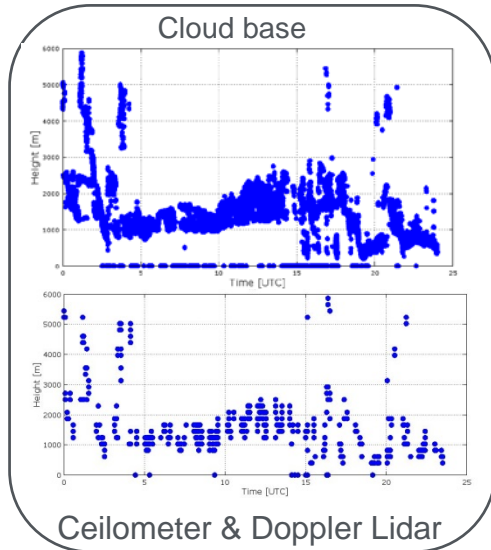
Braunschweig Airport/ Germany 02-05.2015





THE FIRST DEPLOYMENT INSIDE SESAR (2)

- MET Products Generation based on Data fusion and Sensor Synergies

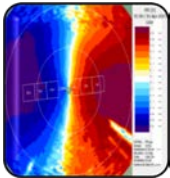




THE FIRST DEPLOYMENT INSIDE SESAR (3)

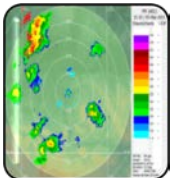
- MET Products Portfolio

Wind



- Low Level Windshear
- Runway oriented shear
- Low Level Turbulence
- Surface wind speed & direction observation
- Surface wind gust observation
- Surface Wind Forecast
- Wind speed & direction aloft
- Storm Nowcast

Convection



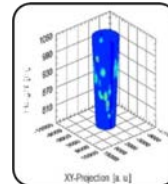
- Precipitation type
- Quantitative precipitation intensity
- Precipitation amount
- Precipitation duration
- Liquid precipitation probability
- Probabilities for precipitation intensity
- Nowcasting
- Lightning

Winter Weather



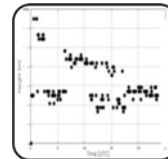
- Snow
- Snowfall probability
- Freezing rain
- Freezing rain probability

Visibility



- RVR
- Cloud base height
- Cloud amount
- Surface Visibility
- Ceiling or Vertical Visibility

Standard MET

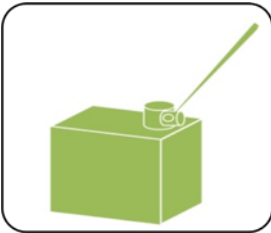


- 2 m air & dew point temperature
- Relative humidity
- Air pressure (QNH & QFE)
- Runway surface temperature
- Low level temperature inversion



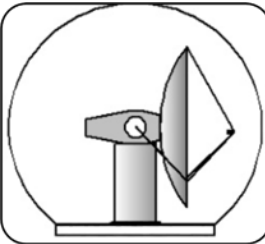
THE FIRST DEPLOYMENT INSIDE SESAR (4)

- MET System Specification



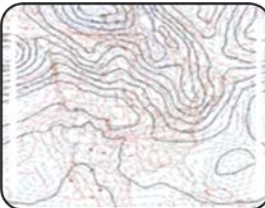
Observation (in-situ & remote Sensors)

- ~20 Sensors integrated
- Sensor specific parameters (range, update rate etc.)
- Sensor Network integrated (Lightning)



Nowcast (X-Band Weather Radar)

- ~100m horizontal resolution
- 100km range
- 1h nowcast horizon
- 5 min update rate

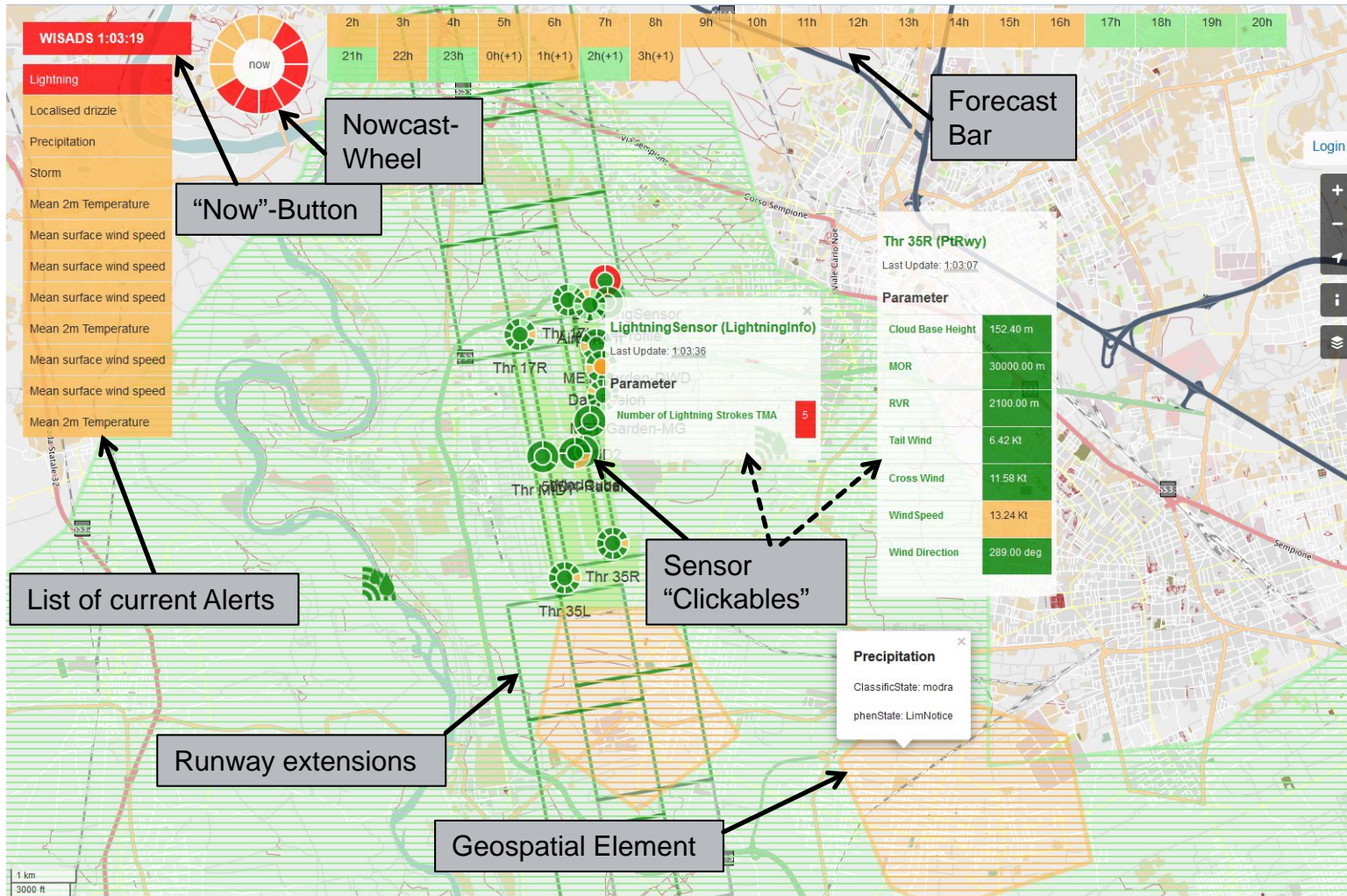


Forecast (COSMO DE)

- 2,8Km horizontal resolution
- 3h update rate
- 27h forecast horizon



WEATHER DECISION SUPPORT DISPLAY

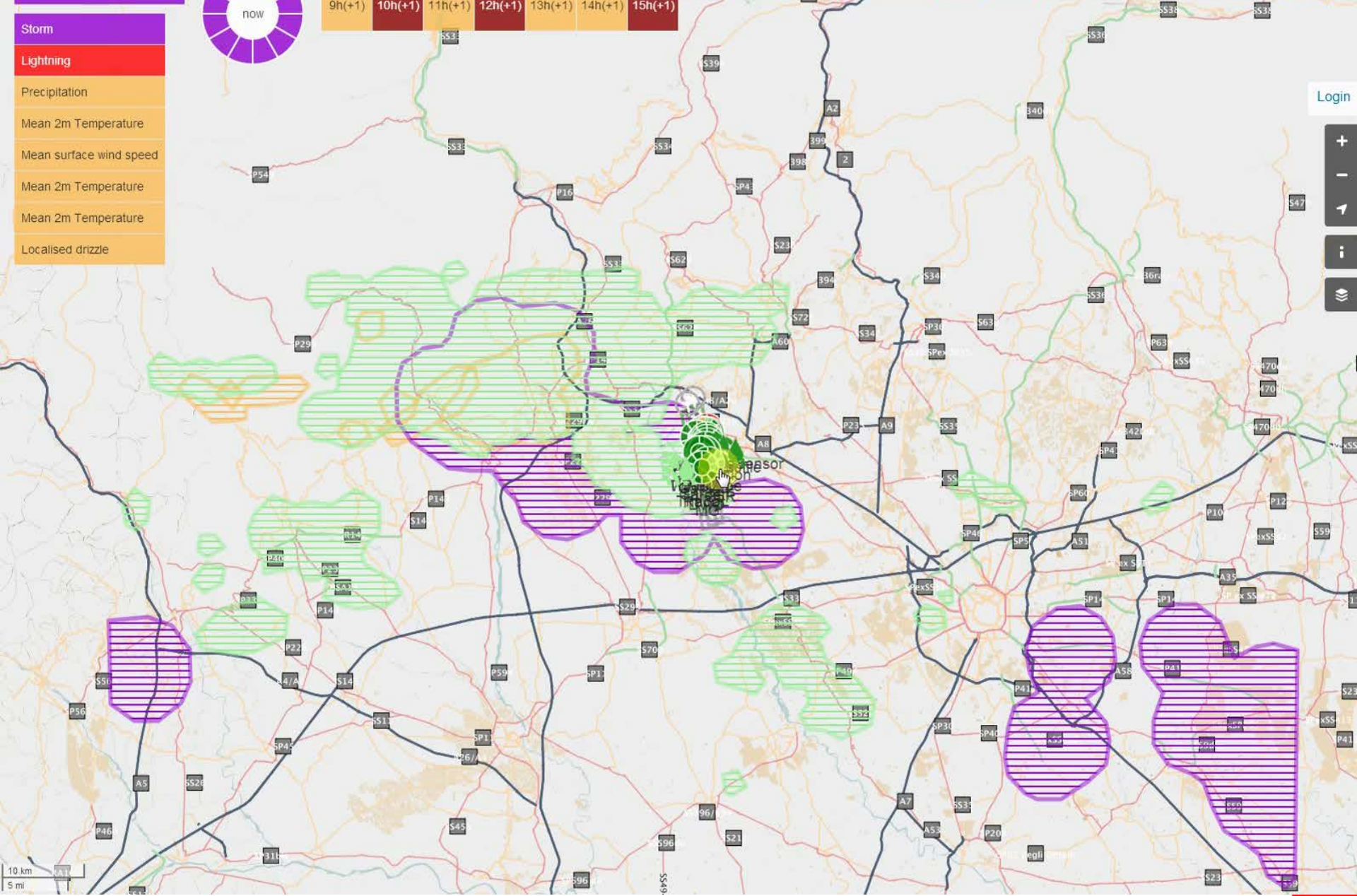


WISADS 13:50:46



14h	15h	16h	17h	18h	19h	20h	21h	22h	23h	0h(+1)	1h(+1)	2h(+1)	3h(+1)	4h(+1)	5h(+1)	6h(+1)	7h(+1)	8h(+1)
9h(+1)	10h(+1)	11h(+1)	12h(+1)	13h(+1)	14h(+1)	15h(+1)												

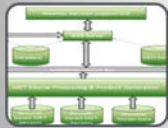
- Storm
- Lightning
- Precipitation
- Mean 2m Temperature
- Mean surface wind speed
- Mean 2m Temperature
- Mean 2m Temperature
- Localised drizzle





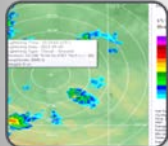
BEYOND AVIATION....

Technology



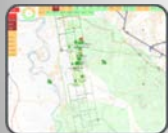
- Service oriented architecture via DDS
- Open Street Map Geo-Server
- Flexible of MET Input Sources

Meteorology

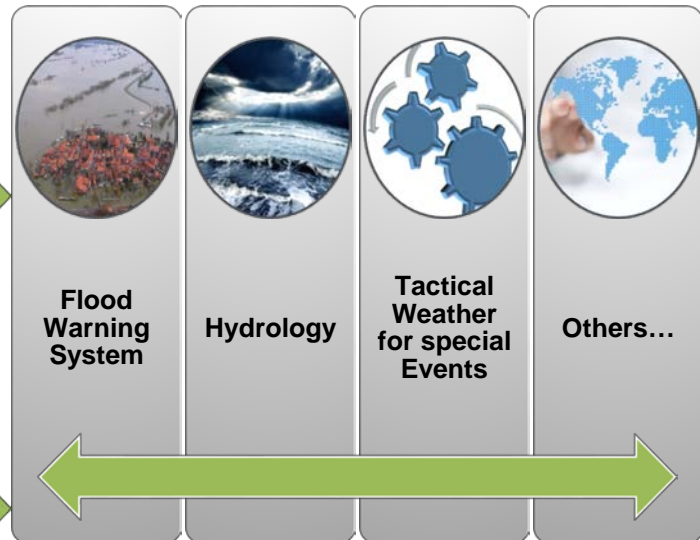


- Providing MET Observations, Nowcasts & Forecasts
- Configurable MET Alerts and Warnings
- Data Fusion capability

Visualization



- Visualization via a standard Browser
- Applicable to every Location
- Multi-Layer GUI





OUTLOOK

- Further Developments
 - ❑ 4D Trajectory integrated Weather objects (SESAR 2020)
 - ❑ Met Hazards Geo Ref. Volumes (Space and time) correlated to flight path
 - ❑ New Products based on Requirements
 - ❑ 3D Weather Objects
 - ❑ 3D Convection
 - ❑ Short-term Forecast of 3D Convection
 - ❑ 3D Windfield
 - ❑ Short-term Forecast of 3D Windfield
 - ❑ Customized services



Thank You

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