

GAARDIAN Project Results & Introduction to The SENTINEL Project

KTN Digital Systems

Location & Timing Programme

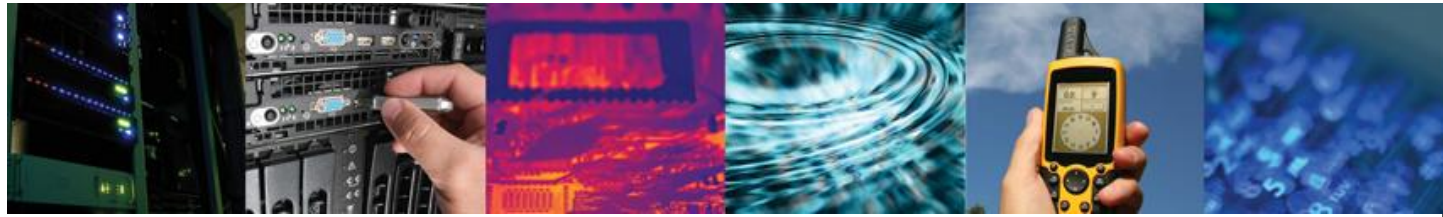
GNSS Interference, Detection & Mitigation Conference

Thurs 11th March 2011

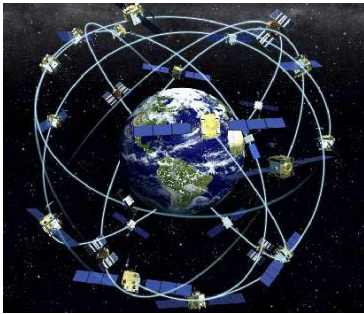
NPL Teddington



**Charles Curry, B.Eng, FIET
MD – Chronos Technology Ltd**

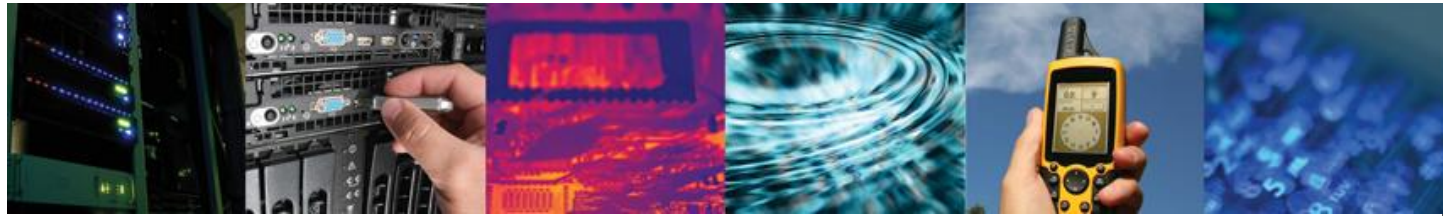


The **GAARDIAN** Project - *GPS Interference Detection & Mitigation*

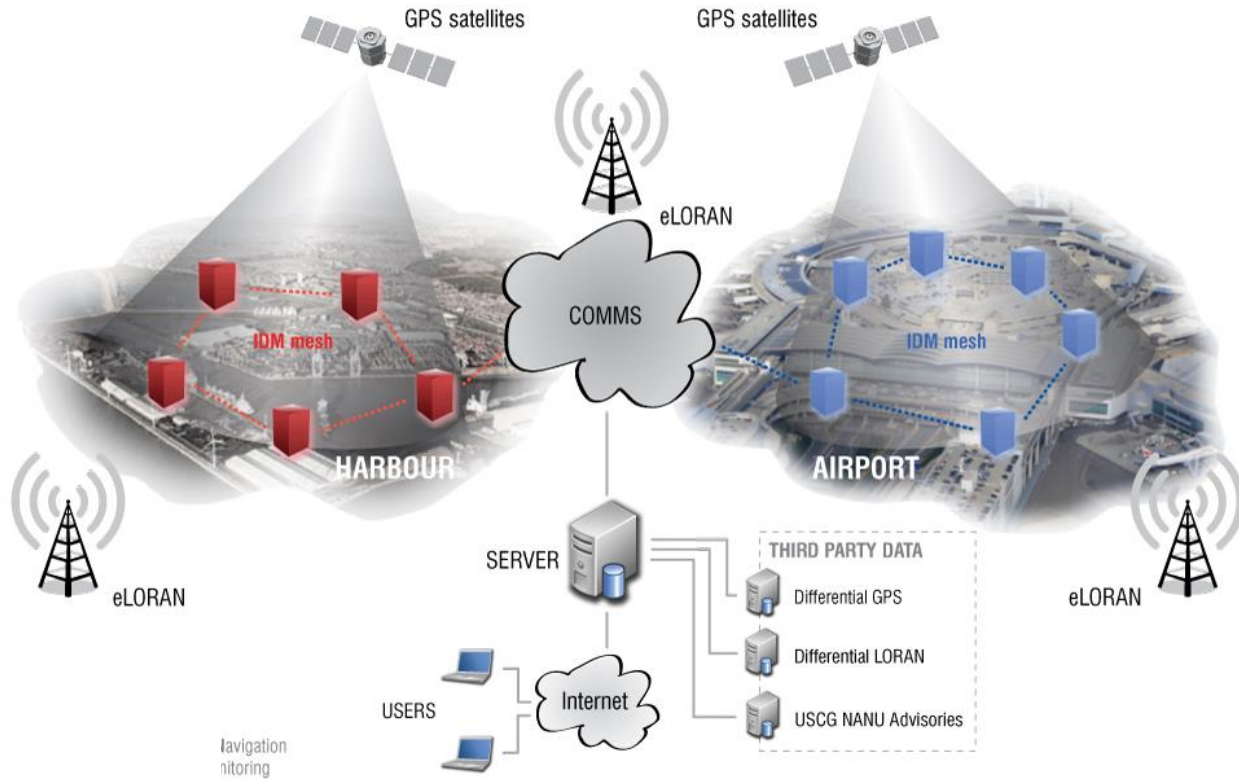


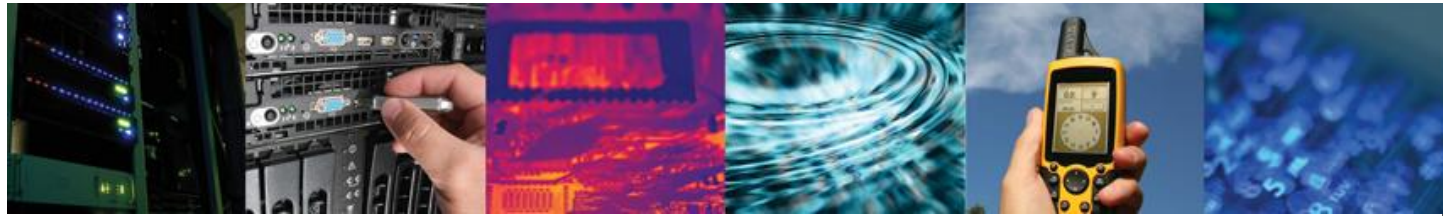
- **GNSS Availability, Accuracy, Reliability and Integrity Assessment** for Timing and Navigation
- UK Government Funded R&D Project (>£2m)
 - through **Technology Strategy Board**
 - ***“Gathering Data in Complex Environments”***
- Research Data Gathering necessary to create a GPS Interference Detection & Mitigation (IDM) network
 - At point of use, 24x7x365
 - for mission & safety critical applications
 - Which use GPS (or GNSS) signals
 - **Leveraging eLoran signals to assist QoS determination**





GARDIAN



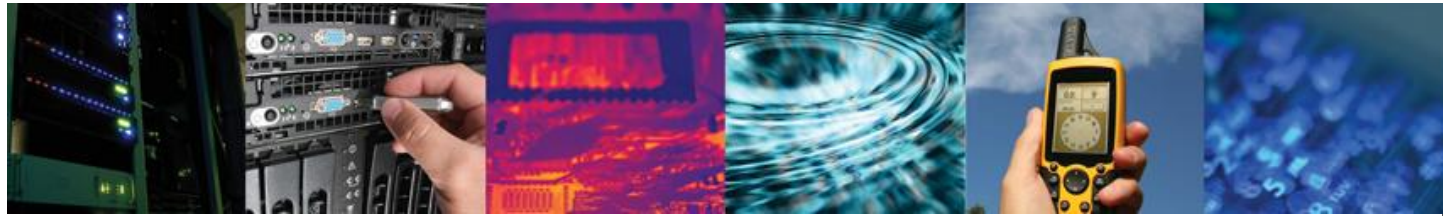


The **GAARDIAN** - Partners



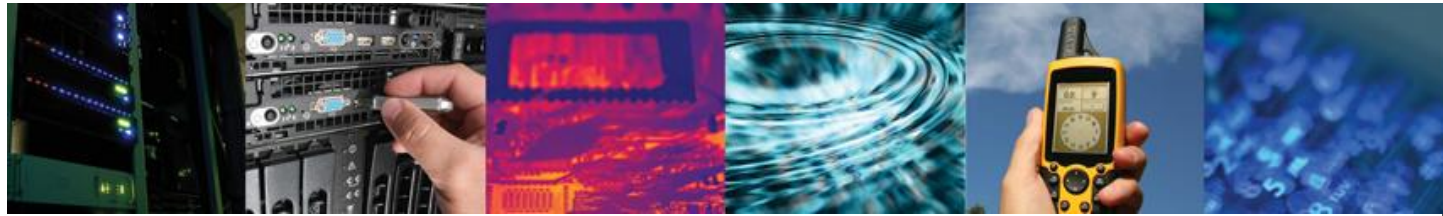
- GLA – General Lighthouse Authorities
 - User Community - Maritime
 - eLoran
- Imperial College London - Dept of Civil Eng
 - User Community - Transport
 - Integrity Monitoring Algorithms
- University of Bath - Dept of Electrical & Electronics
 - GPS & Space Weather
- BT – Adastral Research Laboratories
 - User Community – Telecoms
- Ordnance Survey
 - User Community – Land Geolocation
- NPL – National Physical Laboratory
 - Time, UTC Traceability
- Chronos Technology Ltd
 - Real time Timing measurement to ns granularity
 - GPS products, components & system integration
 - GAARDIAN Project Leader





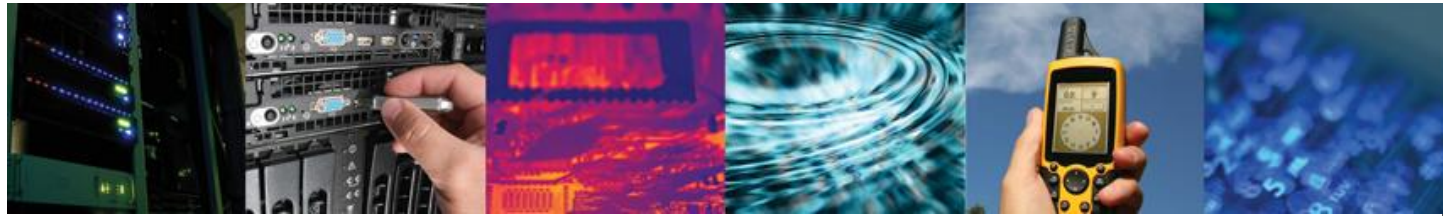
Real Time GNSS & eLoran Integrity Monitoring at Point of Use

- **GAARDIAN** – The Challenges!
 - Manage vast amounts of data from within PNT receivers
 - GPS and eLoran
 - In real time
 - 24x7x365
 - Report unambiguous integrity, accuracy, continuity, reliability
 - Observing many different parameters
 - Adapt a “Telecom” industry optimised hardware probe
 - To be PNT data gathering platform
 - Create a central web based data display and analysis tool
 - Adapt academic algorithms written in Matlab into C++ on Linux
 - UoB, ICL, GLA
 - Source an eLoran Receiver that works!



GAARDIAN – How will PNT Systems be affected?

- Different systems will exhibit different vulnerabilities
 - Some systems may be unaffected
- Different user groups will be susceptible to different vulnerabilities
 - Some industries do build in mitigation
- Vulnerabilities will be evident at different times
 - Environmental impact – weather, space weather
 - Satellite visibility
 - Local infrastructure
 - User movement
- Problems will not be systematic or deterministic



GAARDIAN – Deliverables

Users

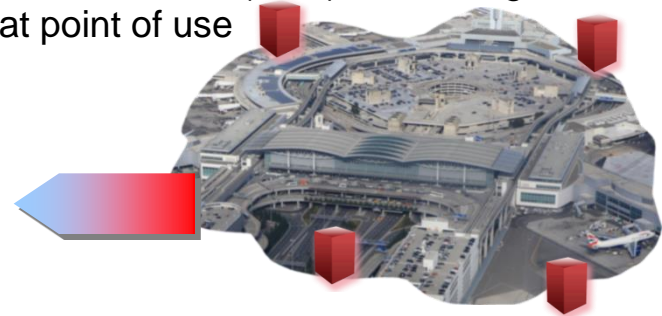


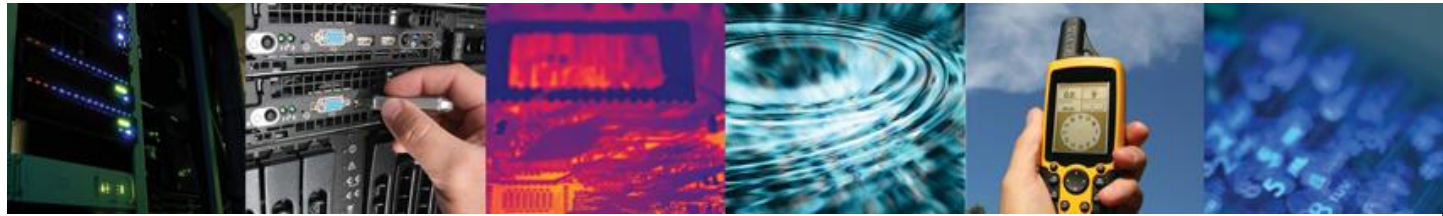
- Develop 24x7 web enabled IDM sensors
 - IDM – Interference, Detection & Mitigation
 - Which can be deployed as networks

- Locally deployed networks of IDM sensors in the vicinity of the user
 - GAARDIAN will deploy trial sensors to analyse data
 - Reduce data at source without losing “content”
 - Heartbeats and “Event” communication back to Server
 - User alert via independent messaging
 - Store for user viewing over internet

- Enable Real-Time GPS, Galileo, Glonass or eLoran (PNT) monitoring
 - For Mission/Safety critical users at point of use

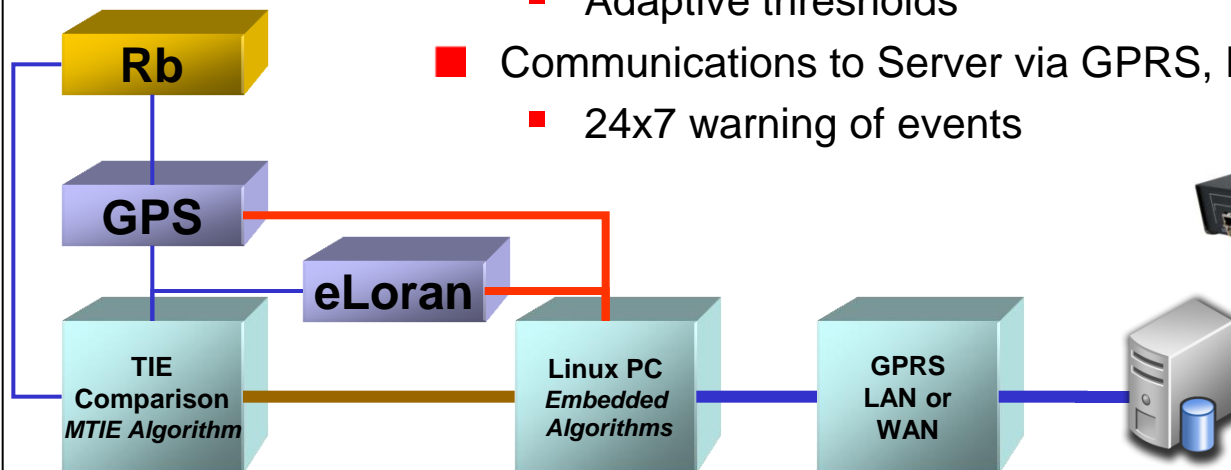
**GAARDIAN
Server**

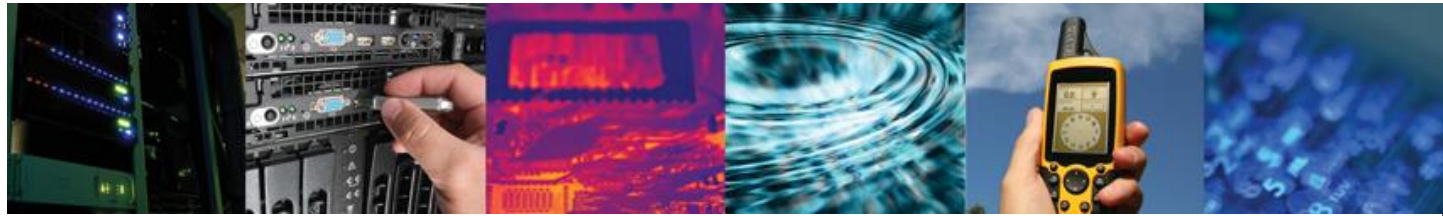




GAARDIAN – IDM Sensor

- IDM Sensors based on Chronos SyncWatch probes
 - Watching GPS & eLoran Signals
- Time Interval Error (TIE) Monitoring between PNT signals from BT
- Embedded Linux to process TIE and PNT data
 - Algorithms from CTL, GLA, ICL and UoB
 - Event severity and manageability discrimination
 - Adaptive thresholds
- Communications to Server via GPRS, LAN or WAN
 - 24x7 warning of events





For Further Information contact:-

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or any of the partners

or visit

www.gps-world.biz/gaardian/index.php