

# GAARDIAN Project Results & Introduction to The SENTINEL Project



**GNSS Interference, Detection & Mitigation Conference**

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Chronos Technology Ltd

KTN Digital Systems

**Location & Timing Programme**

Thurs 10<sup>th</sup> March 2011

NPL Teddington



# GUARDIAN – The Deliverables

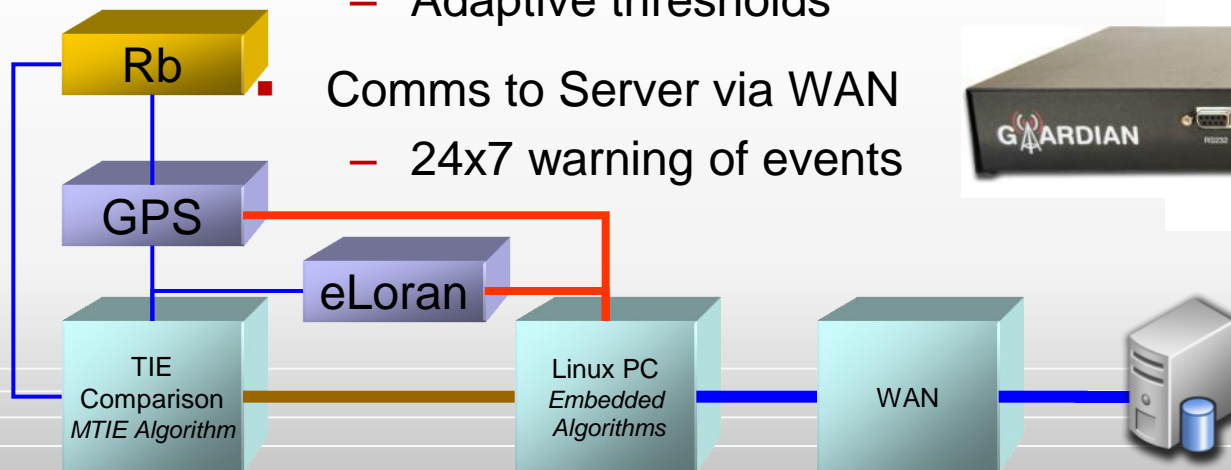


- Develop 24x7 web enabled IDM sensors
  - IDM – Interference, Detection & Mitigation
  - Which can be deployed as networks
- Locally deployed data gathering probes in the vicinity of the user
  - GAARDIAN has deployed 17 probes to analyse data
  - Reduce data at source without losing “content”
  - “Event” communications back to Server
  - Store for user viewing over internet
- Enabling 24x7 real-time GPS & eLoran (PNT) monitoring
  - For Mission/Safety critical users at point of use



# GARDIAN – The Probe

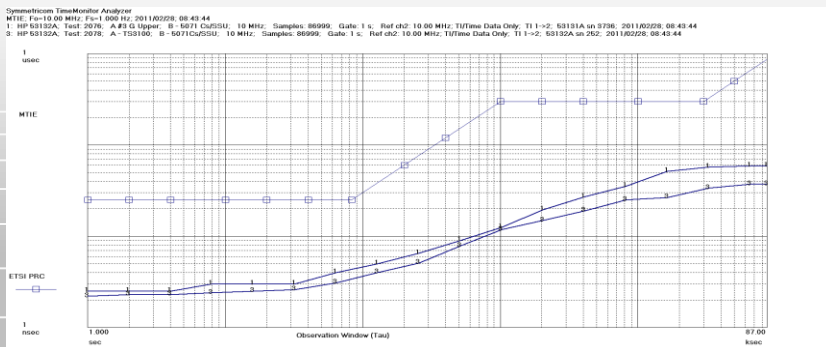
- IDM Sensors based on Chronos SyncWatch probes
  - Watching GPS & eLoran Signals
- Time Interval Error (TIE) Monitoring algorithm between GPS and eLoran 1pps from BT against common Rb Reference
- Embedded Linux to process TIE and PNT data
  - Algorithms from CTL, GLA, ICL and UoB
  - Event severity and manageability discrimination
  - Adaptive thresholds
- Comms to Server via WAN
  - 24x7 warning of events



# GARDIAN – The eLoran Receiver



- During the Project.....
  - USA cancelled their Loran program!
  - Our selected supplier (CrossRate) folded
- Worked with a new global SI of eLoran technology UrsaNav
  - Purchased assets of Locus, Inc,
  - Purchased IP from Plutargus (ex Reelektronika)
  - Purchased assets and IP of CrossRate
- Key Features
  - Frequency performance – Telecom PRS quality
  - UTC aligned 1pps (after Eurofix message)
  - Hitless switchover between eLoran Transmitters



# GARDIAN - Live Demo



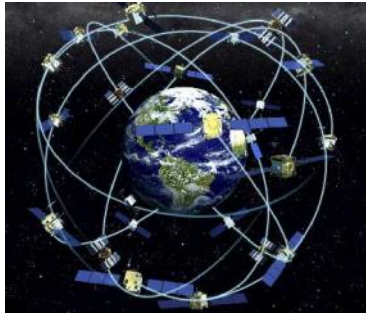
[www.gaardian.co.uk](http://www.gaardian.co.uk)

# GARDIAN – Exploitation



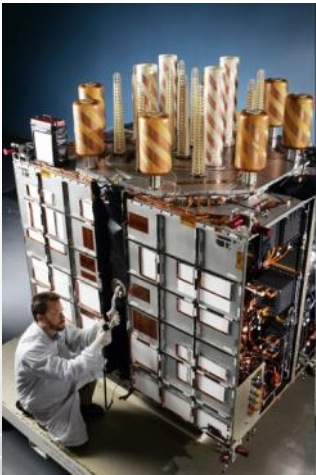
- SENTINEL
  - New TSB Grant funded R&D
- Emerging Global IDM market
- GPS (GNSS) PNT QoS tools
- eLoran PNT QoS tools
- Mitigation of the Jamming & Interference threat for GPS timing systems using eLoran

# - The Project



- GNSS **S**ervices **N**eeding **T**rust **I**n **N**avigation, **E**lectronics, **L**ocation & timing

- UK Government Funded R&D Project, 2 years, ~£1.4m
  - through **Technology Strategy Board**
  - ***“Trusted Services”*** Call



- Research service to establish extent to which GNSS and eLoran PNT signals can be trusted
  - at point of use, 24x7x365
  - In specific user-community applications
  - adding “Location” of interference source





# – The Partners



- ACPO-ITS – Association of Chief Police Officers
  - User Community – Law Enforcement
  - Brings other Government agencies into the collaboration



- GLA – General Lighthouse Authorities
  - User Community - Maritime
  - eLoran



- University of Bath - Dept of Electrical & Electronics
  - GPS & Space Weather

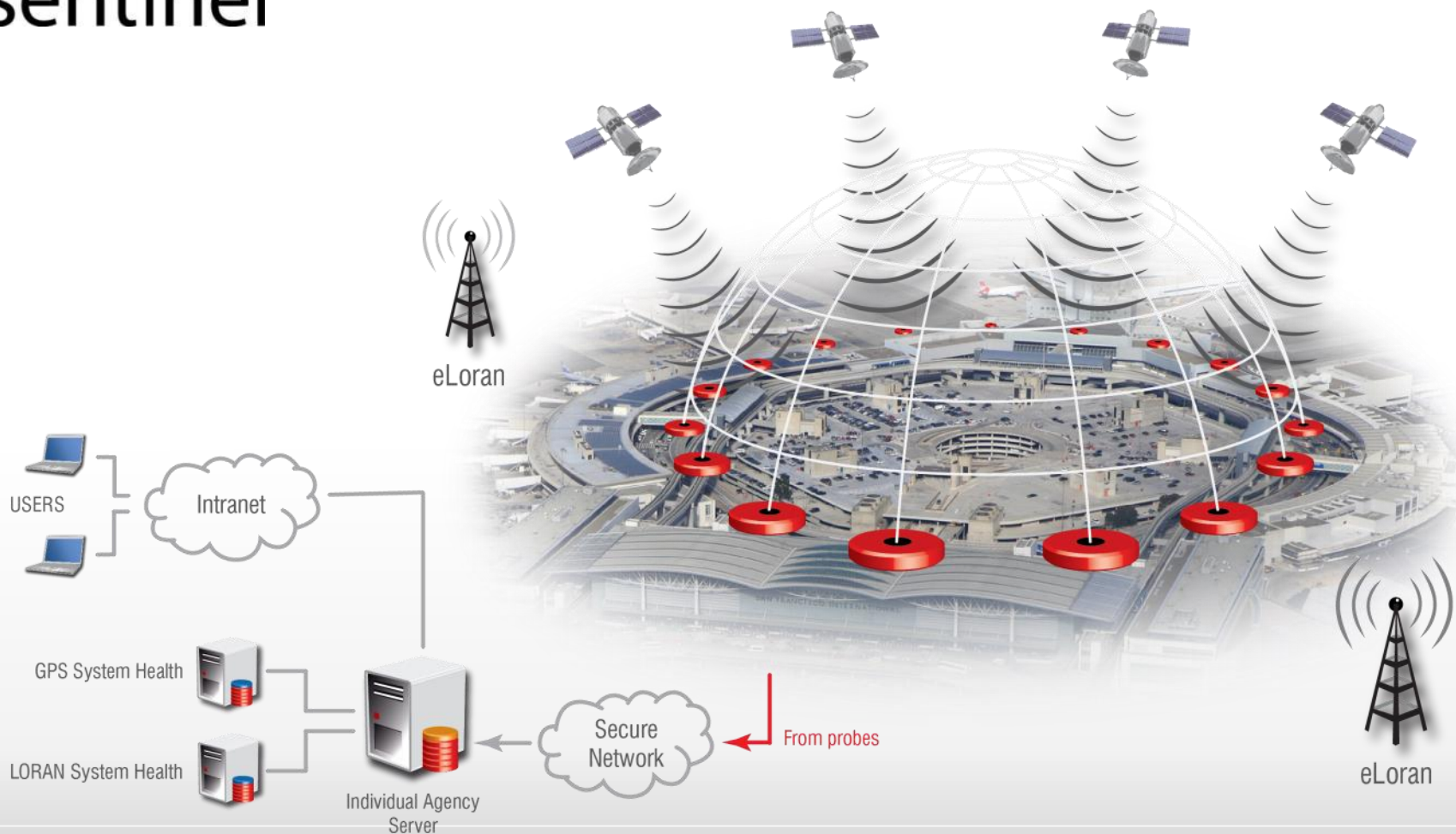


- Ordnance Survey
  - User Community – Land Geolocation
- NPL – National Physical Laboratory
  - Time, UTC Traceability



- Thatcham Vehicle Security
  - Certification of safety critical services
- Chronos Technology Ltd
  - GAARDIAN Research
  - SENTINEL Project Leader

# - The Vision



Real time detection of GNSS interference for critical infrastructure

- Brings together User Community with technology creators
- Will deploy groups or clusters of GAARDIAN probes into “SENTINEL” networks
- Phased Approach
  - Tactical network deployment to prove technology
  - Different scenario deployments
  - Multimodal deployments e.g. Port, Motorway, Airport
- Robust eLoran deployment reception & monitoring

- Discriminate between different types of interference & jamming
- Continue to work under powerful jamming conditions
- Detect weak signal disturbance at “native” GNSS levels
- Locate source of jamming to allow mitigation /neutralization
- Quantify and calibrate operations under different threat scenarios
- Establish and certify best practice for trusted deployment of PNT technology

A horizontal collage of six images: a blue and white abstract pattern, a server room with blue lights, a purple and red abstract pattern, a sunset over a landscape, a blue and white abstract pattern, and a man working on a server rack.

# Chronos Technology Ltd

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