GUTD

GNSS and UMTS Technology Demonstrator

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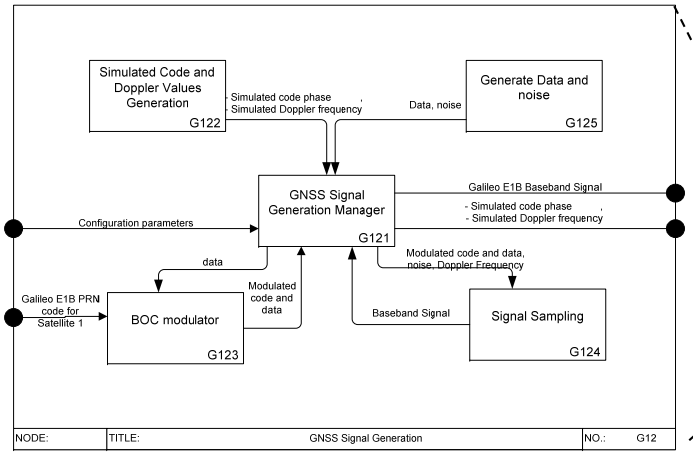
Project Overview - 1

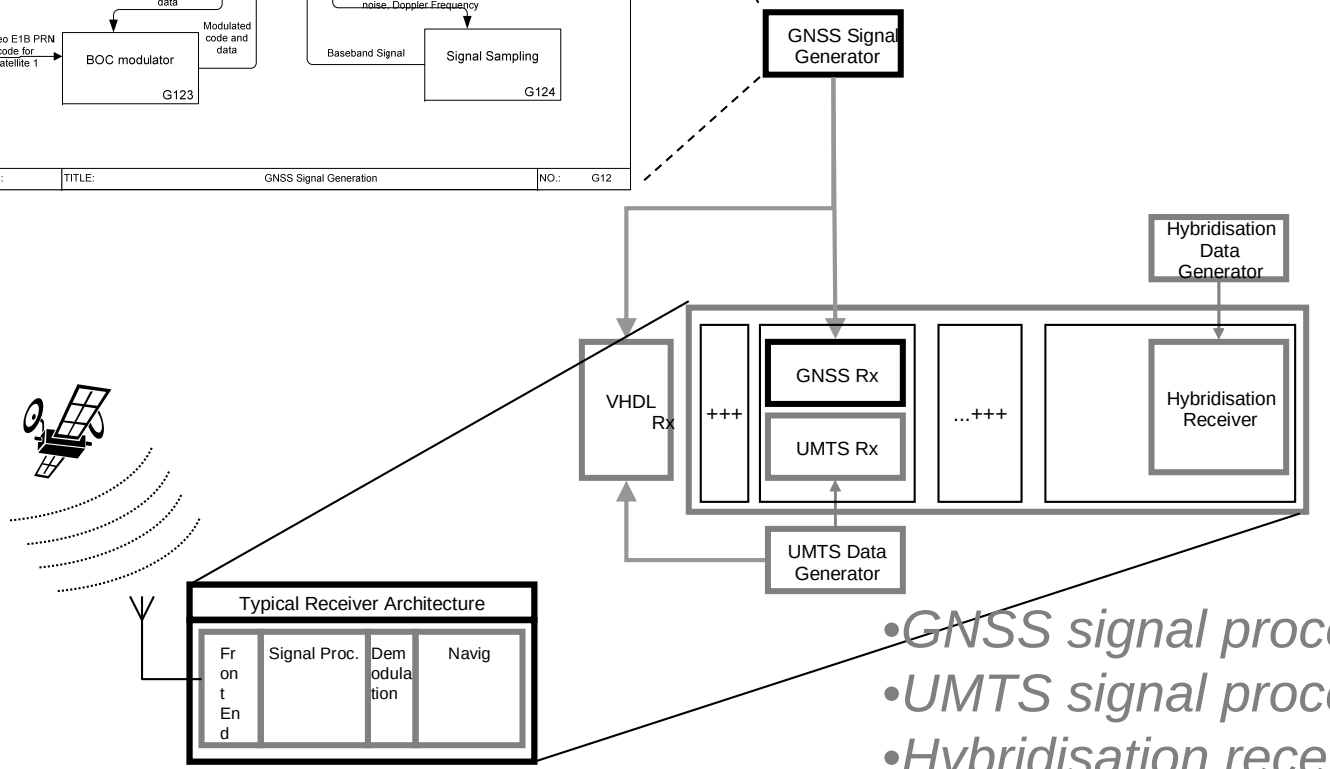
- *The project targeted the study of the use of UMTS and GNSS signal for positioning.*
- *The study required: signal generation, signal processing and hybridisation at navigation level*
- *Main objective is twofold: study the hybridisation at a logical level and physical level. In particular:-*
  - *Study of the problem*
  - *Synergy study at signal processing level*
  - *Synergy study at signal processing level*
  - *Implementation of software based mock up for synergy results*
  - *Implementation of VHDL function for synergy study*

Project Overview – 2 (Technical Concept)

- *GNSS signal generator (IF)*
- *UMTS signal generator (IF)*
- *Hybridisation data generator*



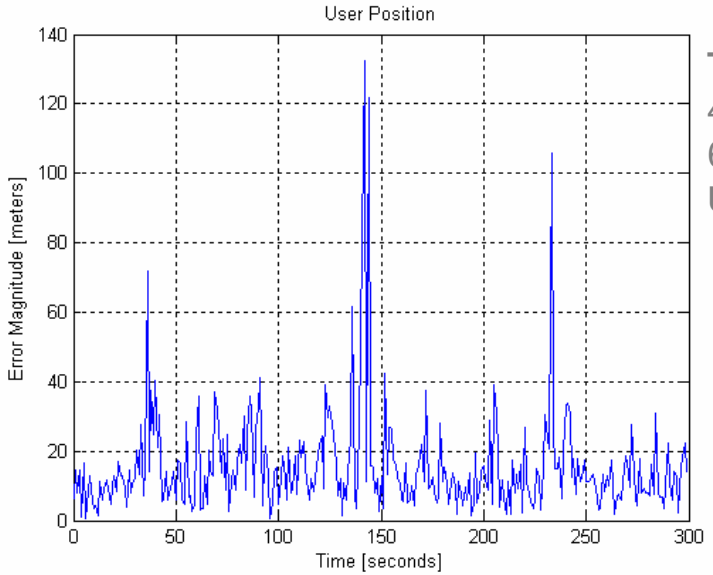
GUTD Concept



- *GNSS signal processor*
- *UMTS signal processor*
- *Hybridisation receiver (partial tight coupling)*

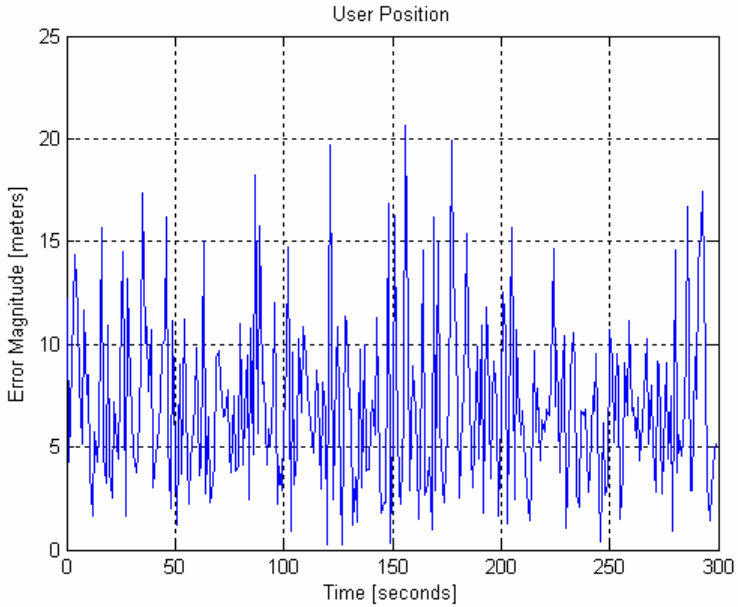
Main Achievements - I

- *UMTS signal is well described and analysed and acquisition and tracking is possible → synergies for signal processing are identified*
- *GNSS and UMTS acquisition and tracking was performed and symbols from generated data was performed*
- *Hybridisation modelling of navigation algorithm (partial tight coupling) was implemented*
- *VHDL implementation allows correlation as being the core acquisition and tracking enabler*



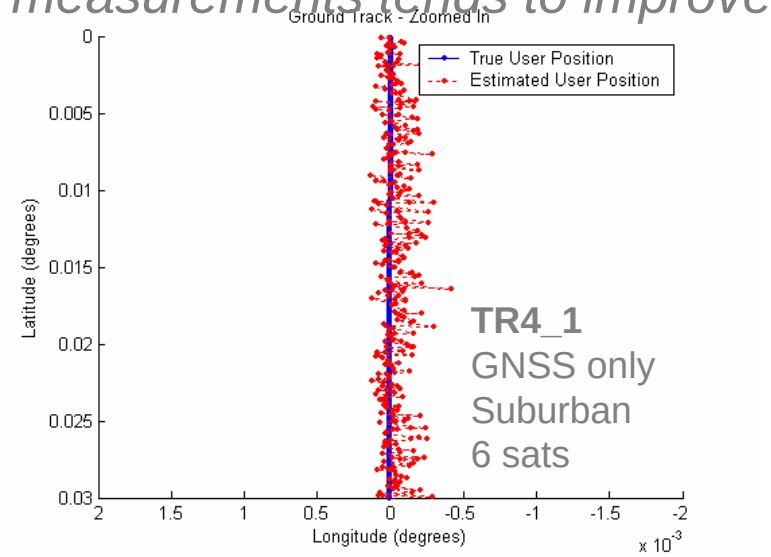
TR3_1
4 GNSS
6 BS
Urban

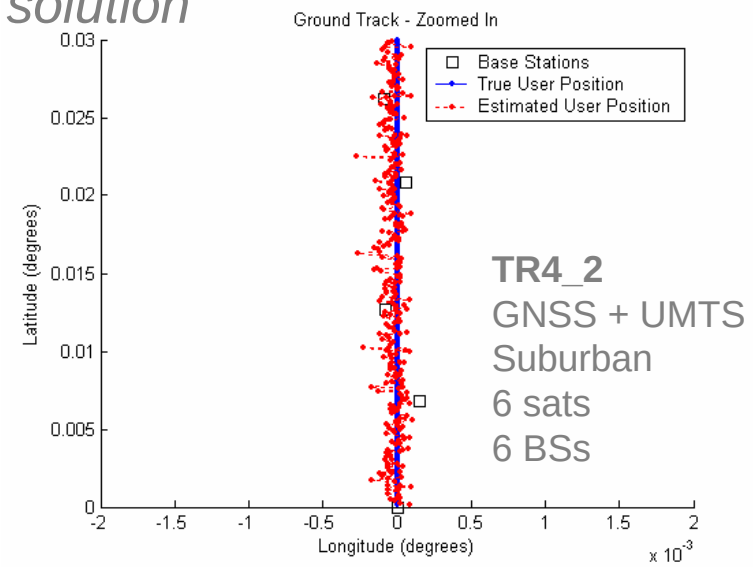
TR3_2
6 GNSS
4 BS
rural



Main Achievements - il

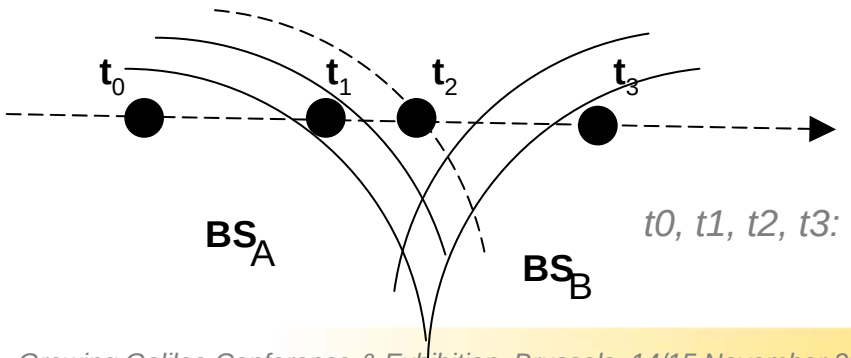
- *The study identifies that partial tight coupling is possible using pairs of emitters of same type.*
- *Software development brings noticeable conclusions, in spite of its simplicity, namely the architecture and modeling of signal transmission*
- *Simulations shows that combination of GNSS and UMTS measurements tends to improve position solution*





Expected Way Forward

- *VHDL and SW balanced development (resources, processing time, size, etc)*
- *Improve the modelling of error sources (as multipath, geometric observation factor, at signal generation, signal processing, tight coupling hybridisation levels)*
- *UMTS protocol study: analysis of the effects of intelligent selection of base stations and incorporation of existing hand-over, and switching, protocols*
- *Application to Indoor boundaries study*
- *General interest by all partners to follow up these ideas*



t0, t1, t2, t3: degradation and transition to UMTS new cell

Vision for the Future

- *UMTS is a communication infra structure ready and covers mostly urban areas*
- *It is in urban environments where satellites might be shadowed and hence low number of visible satellites*
- *Hardware wise, the similarities show that synergies allow to bring to receivers dual signal processing capabilities*
- *It could be exploited in the sense of improving transition to indoor navigation*
- *Actions at the level of standardisation (3GPP) could be undertaken in order to study and accommodate better positioning requirements (base station position disclose)*
- *A word about winning concept is flexibility: use of several systems of measurements or aiding*

Conclusion

- *GUTD allowed to study, develop and draw conclusions*
- *The conclusions are promising*
- *The accomplishment of the work allowed to build knowledge which can be further developed to a prototype*
- *New, and positive, network connections have been made across heterogeneous partners*
- *Timeframe and budget size restricts the range of the developments*
- *We appreciated the way that GJU / GSA has followed up the project*