Embedding a Software GPS Application within a JTRS Software Defined Radio Architecture

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Founded in 1986

Mission Statement

To provide specialized GPS products & services for our customers by leveraging our core technologies, unique technical expertise, innovative engineering, strong work ethic, and high standards of excellence.
Summary of the Problem

- JTRS-HMS requires GPS position and time for networking and waveform initialization
- SAASM is mandated for DoD GPS operations to provide Precise Positioning Service
- Adding SAASM to small form factor JTRS-HMS would exceed size, weight, power budget
- Unattended sensors for Future Combat System (FCS) architecture require accurate GPS position
- Security policy dictates that SAASM devices cannot be left unrecoverable and unattended in UGS sensors
Multi-Level Network Assisted GPS SAASM Architecture

Level 0 Master Unit
(JTRS-GMR with SAASM)

Level 1 Client Unit
(Type 1 JTRS with GPS-Lite)

Level 2 Client Unit
(Type 2 JTRS with GPS-Lite2)
### JTRS Network Assisted GPS (N08-198)

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<tr>
<th>Level 0:</th>
<th>Provides SAASM, NAV and DGPS Network Assisted GPS (NAG) Services</th>
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<td>JTRS with SAASM</td>
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<th>Level 1:</th>
<th>Computes SAASM assisted PPS solution and provides PY Network Assisted GPS (NAG) Services</th>
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<td>JTRS with GPS-Lite Type 1 (Core Radio 2)</td>
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<th>Level 2:</th>
<th>Computes SAASM assisted PPS solution using NAG Services in Type 2 Radio</th>
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<td>JTRS with GPS-Lite2 Type 2 (Core Radio 1)</td>
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TIDGET Ultra Low Power GPS

- RF front-end takes GPS snapshot (Patented)
- Small size < 13 gms
- Lithium battery supports 12 fixes/hr for 1 year
- GPS solution computed in external processor
- Can be adapted for integration with JTRS radio

Commercial components can collect PPS snapshots if they cover GPS 20 MHz bandwidth
GPS-Lite JTRS-PPS Approach

- GPS-Lite in JTRS-HMS
- NAG services speed TTFF
- Snapshot GPS enables low power per fix
- Direct-Y code acquisition supported
JTRS-UGS

Network Database

T-UGS + TIDGET
Sensor
GPS Signal Snapshot

Sensor report

NAG Services

Position Calculation

NAG Services
(SAASM, NAV, DGPS, PYC)

Sensor report

JTRS Radio (CR-2 or GMR)

Intel

NAG Services

Sensor

JTRS Radio (CR-2 or GMR)
**Benefits of JTRS-PPS Approach**

- Provides equivalent performance to SAASM using Network Assistance
  - Direct P(Y) code acquisition
  - Extended functions
- Low Power Operation
  - Takes $1/6^{th}$ power of a DAGR under low dynamic scenarios
  - Power per Fix improved further when using FPGAs
  - Reduces size, weight, and cost for small form factor radios
  - Avoids need for embedded SAASM in every JTRS-HMS form factor
- High Sensitivity
  - Improved operation in GPS degraded environment