WAAS & Timing

Innovative Solutions International
Satellite Navigation Division

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SATNAV
SATELLITE NAVIGATION

Outline

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- **Overview of the WAAS**
- **Role of Time in WAAS**
  - **Time for Data Recording**
  - **WAAS Network Time**
  - **Time for Navigation**
  - **Time Distribution System**

WAAS Overview

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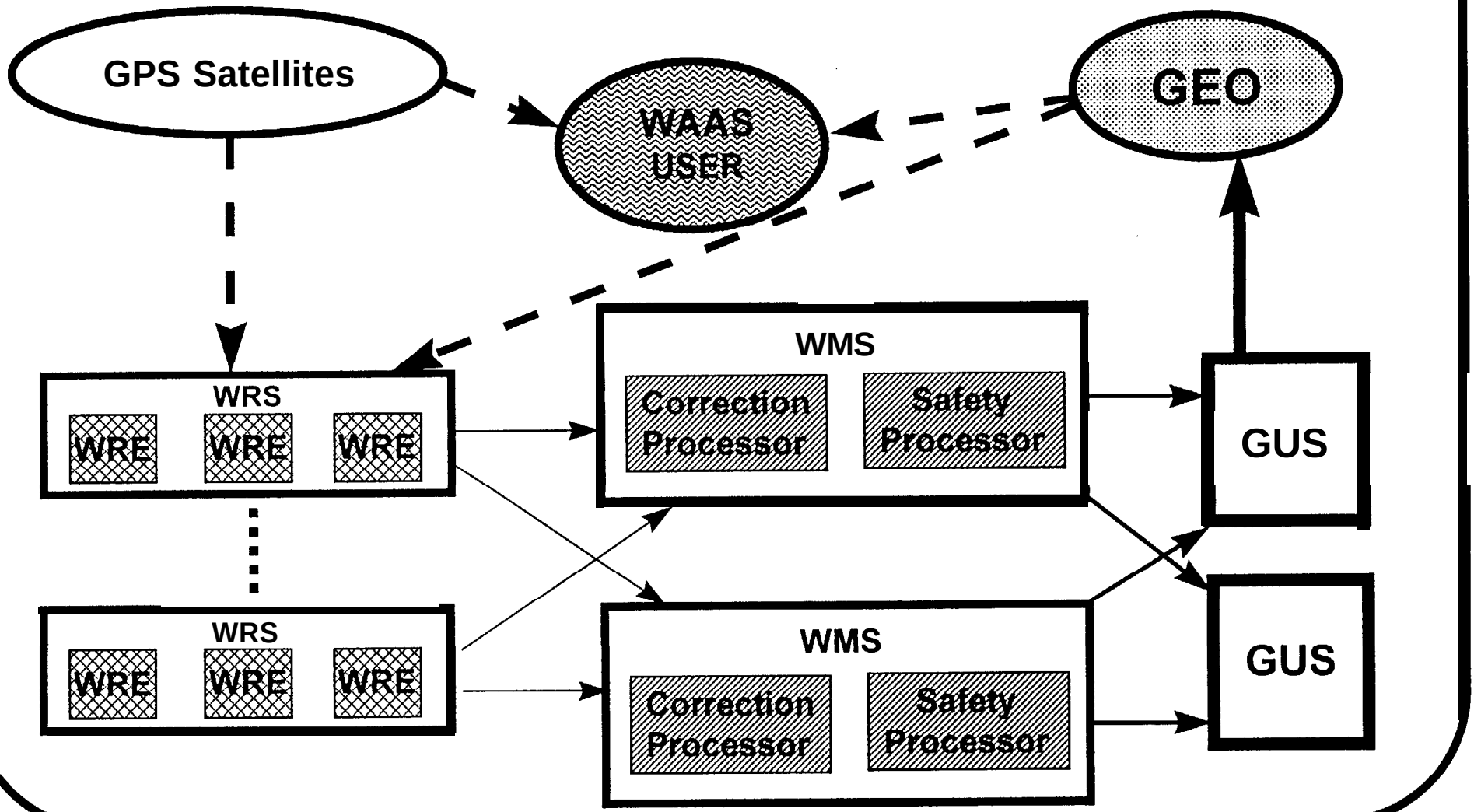

The WAAS Process

- **Each** WRS observes all GPS in view

  Data transmitted to WMS

- **The** WMS computes corrections

  Ionospheric, Clock, Orbit

- **The** WMS transmits data to GUS

  GUS transmits messages to user through Geostationary Satellite

- **User** receives messages from Geostationary Satellite

  User corrects GPS data

WAAS Reference Station

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- 3 Cesium Clocks at each WRS

➡ **Input to a WAAS Rx**

  - Initially set to GPS Time at start-up
  - Free running cesium

➡ **Forms basis for Time of an Observation**

WNT

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- **Average of all primary WRS Cesium Clocks**
  - WMS Correction Processor has algorithm for WNT
  - Computes bias and frequency offset to GPS Time
  - Steering command drives the offsets to zero
- **Tracks GPS Time to within ± 50 ns.**
- **Tracks UTC to within ± 20 ns., after correction by WAAS Message 12**

WAAS Navigation Signal from GEO

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- WAAS Ranging Signal transmitted from **GEO**
- Signal must be transmitted on time
  - **Signal originates from the GUS**
  - **Signal transmitted from GUS is advanced**
    - **Propagation time, ionospheric & instrumental delays**
- Not affected by Selective Availability
- Time reference for ranging signal is WNT

WAAS - Time Distribution System

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- WAAS TDS located at USN0
  - **TDS is like a GPS TTU**
  - **Input will be USN0 MC signals**
- TDS will track WAAS geostationary satellites
  - **Output will be WNT - UTC(USNO)**
- Data will be collected by WMS
  - **WAAS Message 12 will contain UTC offsets**
- WNT - **UTC(USNO)** should be within ± 20 ns.

Concluding Comments

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- April 1999 is target for Signal in Space from WAAS
- Specifications for WAAS TDS have been developed
- Concept and Algorithms for WNT have been developed
- WAAS has potential to be a significant Time Distribution System