

# **DAMS-NT Demodulators**

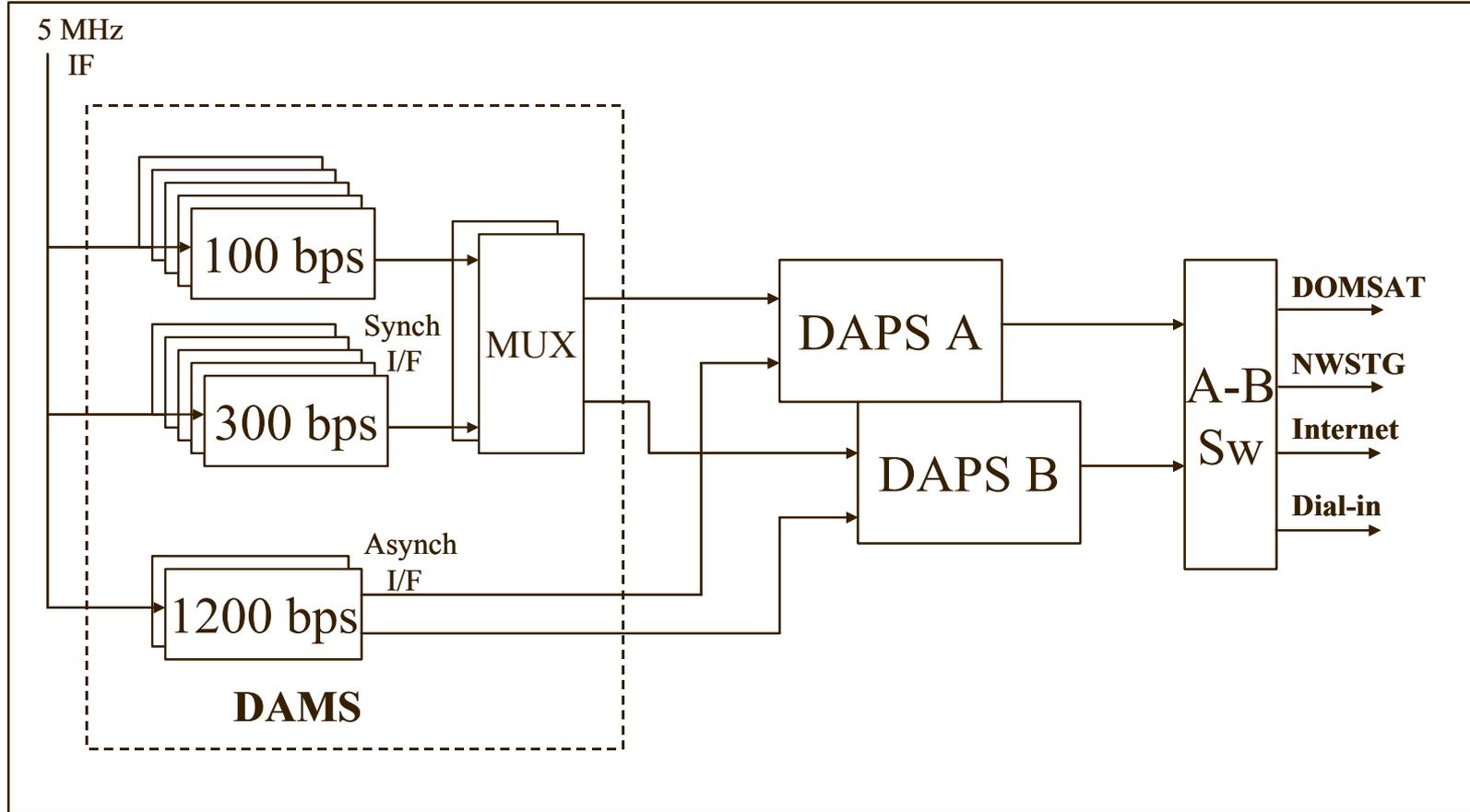
**Frank Street**

# The DAMS-NT Replacement System Goals

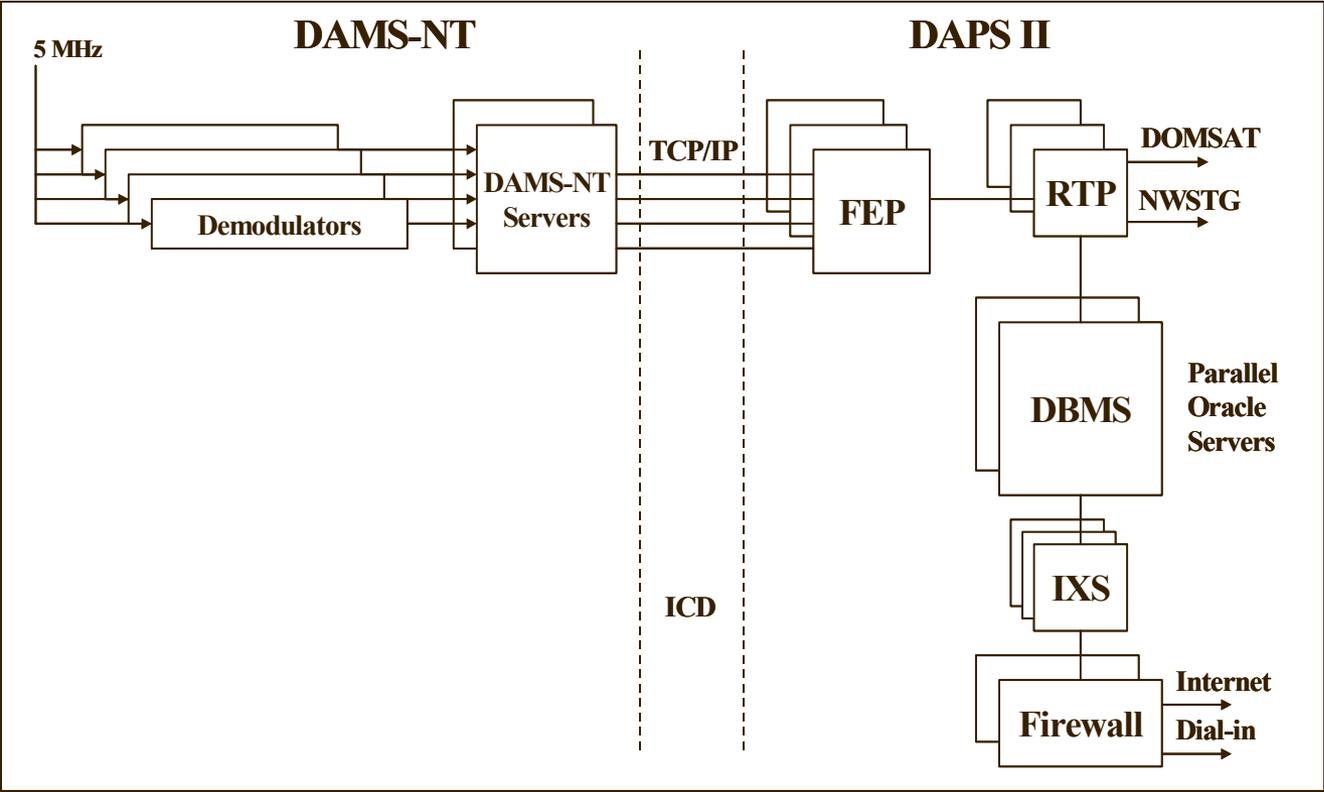
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- **Reduces System Complexity and maintenance by using DSP technologies**
- **Uses standard off-the-shelf computers and DSP methods**
- **Reduces rack space and cabling**
- **Simplifies DAMS-NT to DAPS II interfaces, uses IP**

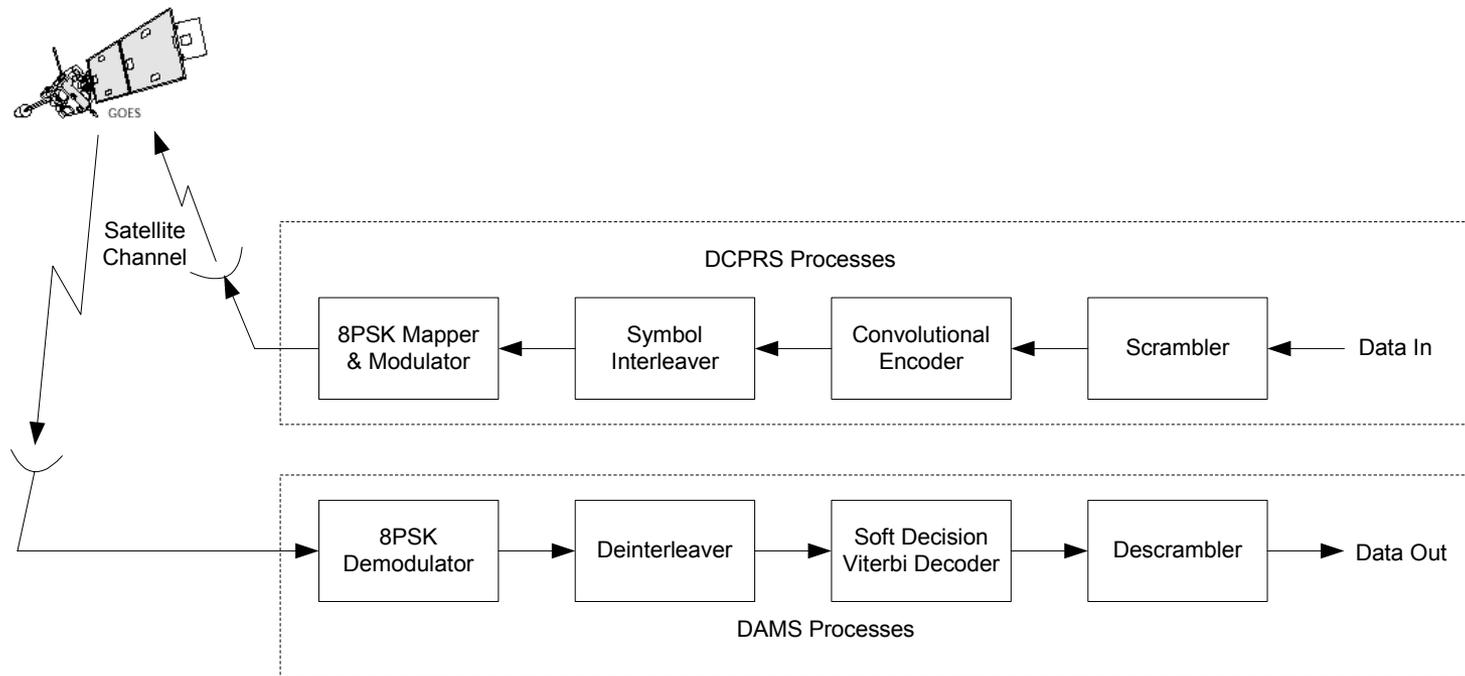
# Current DCS System Configuration



# New DAMS-NT System Configuration



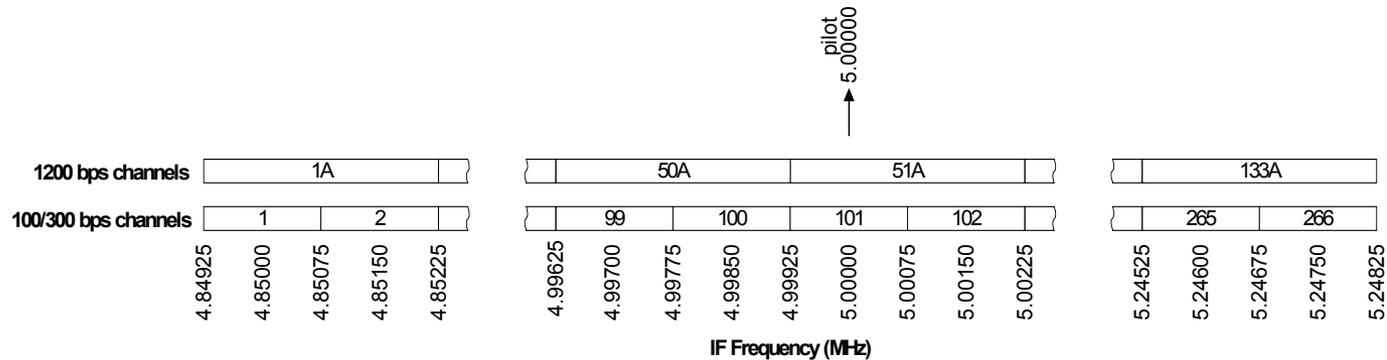
# System Data Flow for DAMS-NT



**Encoding data flow for 300 and 1200 bps units**

# Spectrum Utilization

- 400 kHz of BW
- Two Overlapping frequency Plans with and IF Center Frequency of 5 MHz
- The Band is divided into 266- 1.5 KHz channels or 133 – 3 KHz Channels designed to handle 1200 bps messages



# Key DAMS-NT Parameters

	100 bps	300 bps	1200 bps
PCM type	Bi-L	NRZ-L	NRZ-L
Mod type	PM	8PSK	8PSK
PSK symbol rate	200 sps	150 sps	600 sps
Symbol rate uncertainty	±0.03 sps	±0.025%	±0.025%
Mod Index	±60°	N/A	N/A
Mod Quality	<b>5 deg. RMS</b>	<b>2.5 DEG. RMS</b>	<b>2.5 deg. RMS</b>
Min. $E_b/N_o$	10.4 dB-Hz, BER=1X10E-4	10.2 dB-Hz, BER=1X10E-4	10.2 dB-Hz, BER=1X10E-4
Min. $C/N_o$	30.4 dB-Hz	35 dB-Hz	41 dB-Hz
Encoding	none	conv. K=7, R=2/3	conv. K=7, R=2/3
Scrambler	none	always	always
Frequency Uncertainty	<b>≤500 Hz</b>	<b>≤500 Hz</b>	<b>≤500 Hz</b>
Interleave (determines FSS)	a. none	a. none b. short = 16w x 24d c. long = 24w x 32d	a. none b. short = 16w x 24d c. long = 24w x 32d
Frame Synch Sequence (FSS) Codes	a. 100010011010111	a. 000001011001110 = no b. 000100011101001 = short c. 001111100110101 = long	a. 000001011001110 = no b. 000100011101001 = short c. 001111100110101 = long
Message Data Format	ASCII Pseudo Binary	ASCII Pseudo Binary	ASCII Pseudo Binary

# DAMS-NT Demodulators

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## General Requirement

- Provide reliable recovery of 100, 300 bps and 1200 bps DCPRS messages.
- Perform signal analysis on each message as its being received, by making qualitative and quantitative measurements.
- Interface to the DAPS II

# Performance of DAMS NT Demodulators

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- Current DAMS-NT meets the following performance data quality requirements for 100 bps mode
  - At  $E_b/N_0$  of 10.4 dB-Hz the BER is  $1 \times 10^{-4}$
  - At  $E_b/N_0$  of 11.4 dB-Hz the BER is  $1 \times 10^{-5}$
  - At  $E_b/N_0$  of 12.4 dB-Hz the BER is  $1 \times 10^{-6}$  or better.
  
- Current DAMS-NT meet the following data quality performance requirements for 300 bps mode and 1200 bps mode
  - At  $E_b/N_0$  of 10.2 dB-Hz the BER is  $1 \times 10^{-4}$
  - At  $E_b/N_0$  of 10.9 dB-Hz the BER is  $1 \times 10^{-5}$
  - At  $E_b/N_0$  of 11.4 dB-Hz the BER is  $1 \times 10^{-6}$  or better.

# Performance of DAMS NT Demodulators

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## **Transmitter Noise in Channel limitations**

The performance of the DAMS-NT demodulators is limited by (mainly) in-band  $1/f$  noise from the transmitter. This  $1/f$  noise affects the demodulators ability to track the Carrier and maintain data synchronization at low  $E_b/N_0$  levels

## **Additional Key Parameters verified and tested**

- Acquisition Time
- Probability of False Acquisition
- Probability of De-Acquisition
- Probability of Acquisition
- Signal Drift Rate

# Impact of Proposed Transmitter Changes on DAMS-NT

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- The DAMS-NT demodulators are largely compatible with the proposed changes to the transmitters, no real performance modifications required
- SRRC filter parameters will have to be entered into DAMS-NT system- DAMS-NT has been designed such that these modifications can be implemented quickly
- However, Transmitter and Demodulator SRRC filters must operate as matched pairs,
- DAMS-NT can adapt to new frequency Plans,