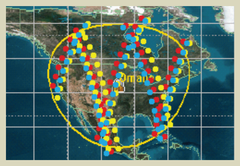
National Polar-Orbiting Operational Environmental Satellite System (NPOESS)

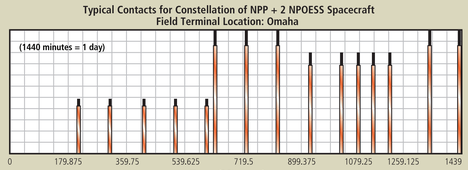
Field Terminal Segment

Field Terminal Concept

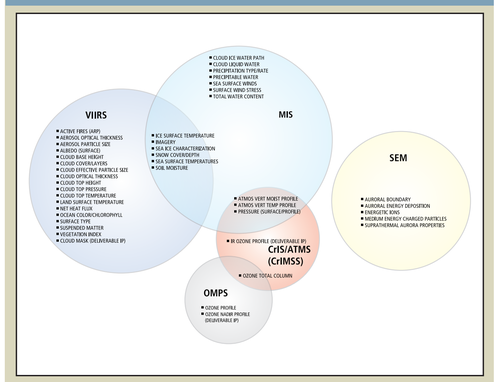
Typical Received Contacts – Omaha FT (41N 96W), One Day



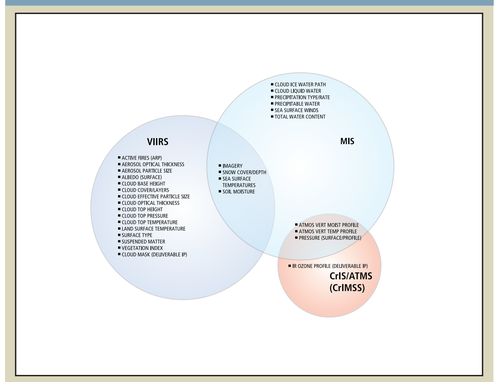
Typical Contacts for Constellation of NPP + 2 NPOESS Spacecraft
Field Terminal Location: Omaha



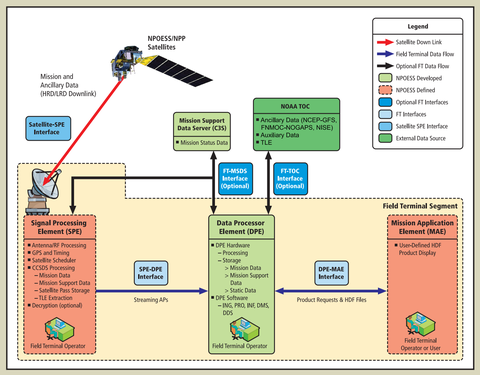
HRD EDR-to-Sensor Mapping



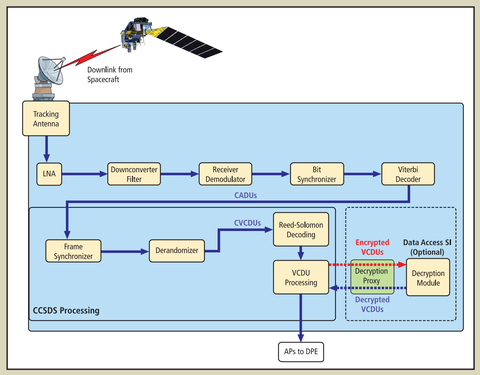
LRD EDR-to-Sensor Mapping



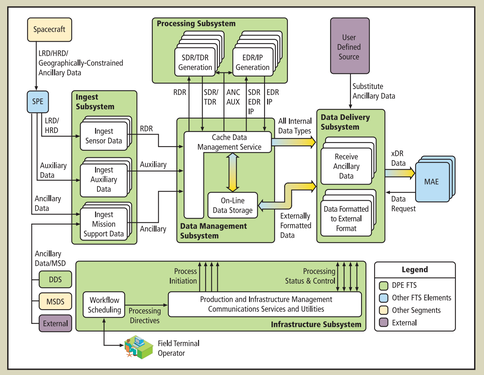
FTS Architecture



FTS Subsystems – SPE



FTS Subsystems – DPE



Satellite Contacts – NPP + 2 NPOESS (1330, 1730)

Latitude (degrees N/S)	Total Contacts (17 day period)	Average Contacts (per day)	Maximum Contact Duration (minutes)
0	193	11.35	12.89
10	195	11.47	12.90
20	204	12.00	12.92
30	226	13.29	12.95
40	260	15.29	12.99
50	326	19.18	13.03
60	502	29.53	13.07
70	564	33.18	13.10
80	725	42.65	13.12
90	724	42.59	12.37

FTS SPE 24 Hour Storage Estimates (GB)
Constellation of NPP + 2 NPOESS Satellites (1330, 1730)

Latitude (degrees N/S)	NPP-Era HRD	NPOESS-Era HRD	NPOESS-Era LRD
0	10.90	39.97	5.64
10	11.01	40.35	5.69
20	11.51	42.22	5.96
30	12.75	46.76	6.60
40	14.67	53.79	7.59
50	18.40	67.48	9.52
60	28.33	103.89	14.66
70	31.84	116.73	16.47
80	40.92	150.05	21.17
90	40.86	149.83	21.14

Note: NPP is HRD only; there is no NPP in the LRD data stream.
Note: FTS does not officially support NPP; these data are provided for information only.

FTS DPE 24 Hour Storage Estimates (GB)
Constellation of NPP + 2 NPOESS Satellites (1330, 1730)

Latitude (degrees)	NPP-Era HRD	NPOESS-Era HRD		NPOESS-Era LRD	
	NPP	NPP + C1	NPP + C1 + C2	C1	C1 + C2
0	89.86	111.43	238.19	86.10	189.62
10	90.82	112.76	241.18	87.02	191.79
20	95.44	119.26	255.76	91.47	202.37
30	106.85	135.56	292.52	102.46	228.75
40	124.97	162.17	353.07	119.94	271.43
50	161.76	218.58	519.99	155.49	360.62
60	269.50	398.56	1016.85	260.02	637.71
70	310.91	475.41	1128.33	300.33	749.22
80	426.68	689.22	1772.55	413.30	1072.07
90	425.90	687.74	1726.72	412.55	1069.87

Note: NPP is HRD only; there is no NPP in the LRD data stream. Note: FTS does not officially support NPP; these data are provided for information only.

FTS DPE Predicted Processing Requirements

Constellation of NPP + 2 NPOESS Satellites (1330, 1730)
2.6 GHz Processors, Split VIIRS SDR Architecture
10/19/2006 Results

EDR Set	HRD		LRD	
	Processors	Maximum EDR Latency (Minutes)	Processors	Maximum EDR Latency (Minutes)
Full NPOESS EDRs	18	6.00 (All EDRs) 1.90 (Imagery EDRs)	16	5.00 (All EDRs) 1.90 (Imagery EDRs)

FTS DPE Memory Requirements

Constellation of NPP + 2 NPOESS Satellites (1330, 1730)

Storage Units	NPP	NPOESS
MB	52934.77	265119.72
GB	51.69	258.91

Link Characteristics

Link Parameter	HRD	LRD
Channel Data Rate	40 Mbps	7.76 Mbps
Modulation with bit interleaving	SQPSK with square root raised cosine pulse shaping [alpha = 0.5]	SQPSK with square root raised cosine pulse shaping (alpha = 0.5)
Coding	(255, 223) Reed-Solomon with I=4	(255, 223) Reed-Solomon with I=4
Convolutional Encoding: Code Rate Constraint Length Connection Vectors Phase relationship Symbol inversion Number of encoders Branch Encoder Sent to I Modulator Sent to Q Modulator	 ½ 7 bits G1=1111001, G2=1011011 G1 associated with first symbol On output path of G2 1 No G1 Symbol inverted G2	 ½ 7 bits G1=1111001, G2=1011011 G1 associated with first symbol On output path of G2 1 No G1 Symbol inverted G2
Randomization	$h(x) = x^8 + x^7 + x^5 + x^3 + 1$	$h(x) = x^8 + x^7 + x^5 + x^3 + 1$
Maximum Occupied Bandwidth (98% power)	30.8 MHz	6.0 MHz
BER after decoding	$< 10^{-8}$	$< 10^{-8}$
Carrier Frequency	7834MHz	1707.0 MHz
Polarization	RHCP	RHCP
Minimum elevation angle	5.0 degrees	5.0 degrees
Orbit-averaged availability	99.6%	99.9%
Data Format	NRZ-M (Prior to Convolutional encoder)	NRZ-M (prior to Convolutional encoder)

Assistance in the Development of NPOESS Field Terminals

To assist the user community in developing field terminal hardware for the NPOESS era, the Integrated Program Office (IPO) is developing a Reference Field Terminal, which will accept both the HRD and LRD downlinks and will be used to demonstrate the functionality specified in the Field Terminal Technical Specification.

The following documents and software are being developed under the NPOESS contract for free distribution to field terminal equipment vendors around the world:

- The minimum specifications required for these terminals will be documented in the Field Terminal Technical Specification
- All necessary external interfaces will be documented in the Field Terminal Interface Control Document
- Processing software to convert the Satellite Direct Readout data stream into Environmental Data Records will be available without licensing fee

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