

CLEEN FP3 DELIVERABLES

D524

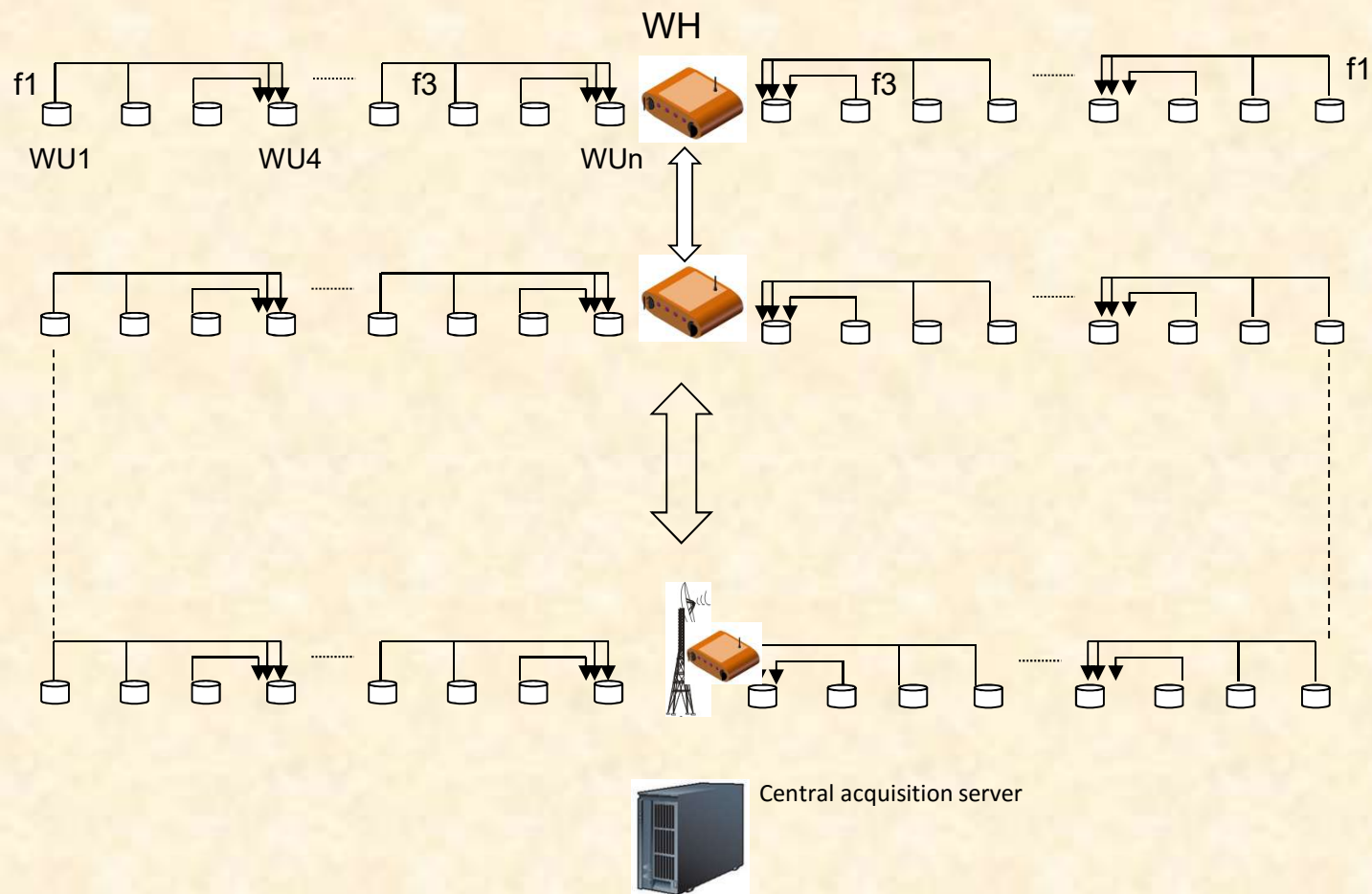
VIBROMETRIC WP 5.1.3

Seismic Characterization and Monitoring

3) D524 - CONCEPTUAL DESIGN OF AN INTELLIGENT WIRELESS SURFACE RECEIVERS ARRAY

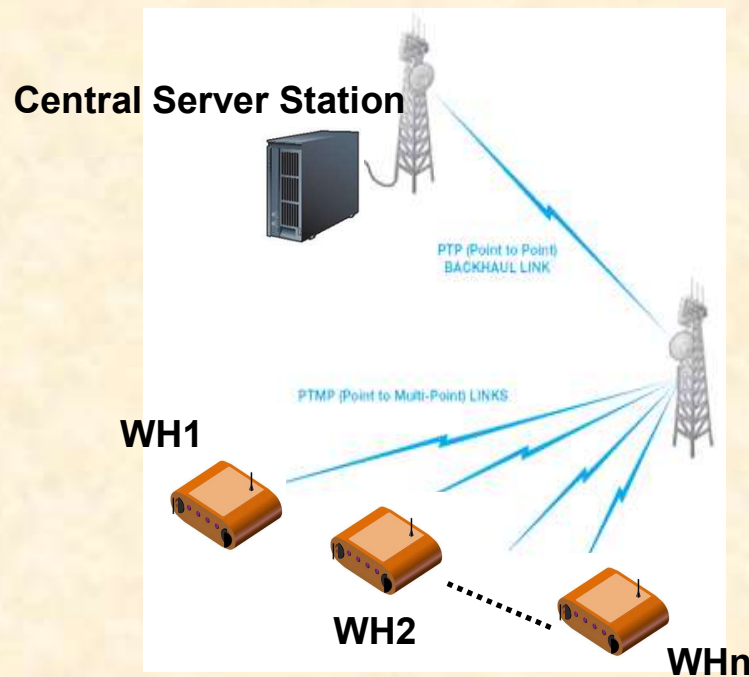
- This development is important to adding the continuity to a fully integrated monitoring system catered for CO₂ storages. The projected features are complex and require time beyond the FP3 to fully complete. However, the Concept Definition, Features Definition and Full Specifications Definition will be in the final Report end of next month (D504 and D505).
- Next slides will give some highlights of the main necessities for the system and the main conceptual features of our design.
- Few outstanding innovations:
 - self-configuring network
 - self-decision intelligence (i.e. in case of malfunction of 1 unit, automatic rerouting transmission via the most proximal unit
 - **full wireless** – the land-geophone is connected wirelessly to the processing/network unit (WU) – not by wire as all competitors. The WU carry the wireless geophone which will then be deployed near the unit in the grid. The wireless geophone (WG) will powered by small battery and its **loading will be done wirelessly** from the WU's batteries.

D524 - CONCEPTUAL DESIGN OF AN INTELLIGENT WIRELESS SURFACE RECEIVERS ARRAY



D524 - CONCEPTUAL DESIGN OF AN INTELLIGENT WIRELESS SURFACE RECEIVERS ARRAY

- Due to the large amount of channels for a real life seismic surveys, the Wireless Units (WU) of a line are connected to the Wireless Hub (WH).
- Each Wireless Hub will communicate their data to a long distance digital radio relay (located near-by the last Wireless Hub in the network) to transmit all data acquired in real time to the central station.



D524 - NETWORK SELF-CONFIGURATION

Legend of the above:

WU₁: Wireless Unit 1 transmits its own data. Same for WU₂, WU₃ etc...

WU₄ (WU₁): Wireless Unit 4 transmit data of Wireless Unit 1.

Same for WU₄ (WU₂), WU₄ (WU₃) etc.....

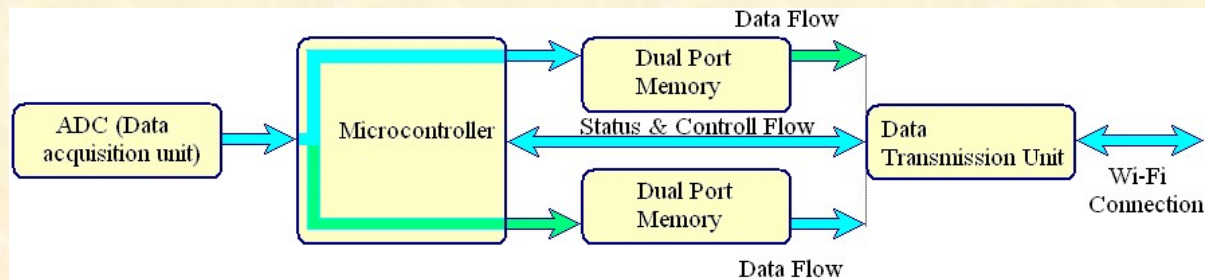
D524 - MAIN CHARACTERISTICS OF WIRELESS UNIT (WU)

Parameter	Desired value	Typical value currently on the market
Sampling rate	4000 samples/second	500 (1000) samples/second
Number of seismic channels	Thousands/Tens of thousands	Hundreds / Thousands
Analog-to-digital converter (ADC) bits	24	24
Wireless data transmission	Yes – based on latest 802.11ac technology	Yes
Wireless unit number of geophones	1/3	1/3
Wireless unit flash memory	32/64 GB	16/32 GB
Wireless unit battery life	Days	Days
Wireless unit solar panel	Yes	No
Wireless unit GPS	Yes	Yes
Wireless unit Near field communication (NFC)	Yes	No - only radio-frequency identification (RFID) available
Array self-configuration	Yes	Rare
Array self-diagnostic	Yes	Rare
Seismic data compression	Maybe	No
Seismic data stacking on the wireless unit	Yes	No
Real-time seismic data transmission	Yes – for thousands of channels	Yes – for hundreds of channels / No (data harvesting after data acquisition)

D524- Required Throughput for Wireless Unit (WU)

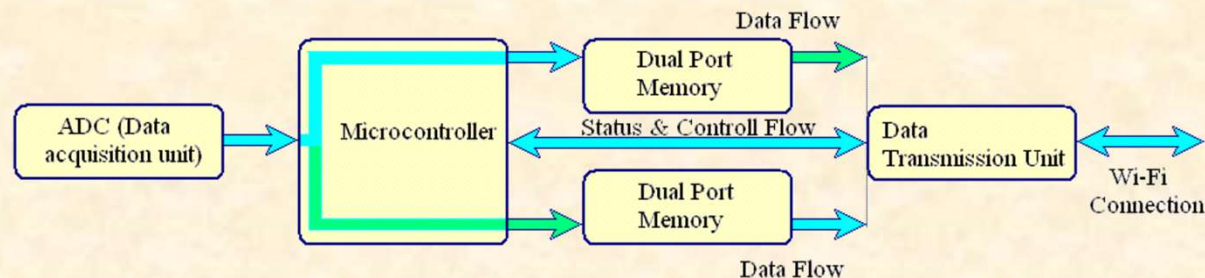
In the bellow table is determined the necessary throughput for a WU:

Sample rate, samples/second	4,000
ADC bits	24
Geophones per Wi-Fi unit	3
Protocol overhead ⁽¹⁾	1.40
Throughput, Mbps / Wireless unit	
(= sample rate x ADC x no. geophones x overhead / 1000 /1000)	0.403

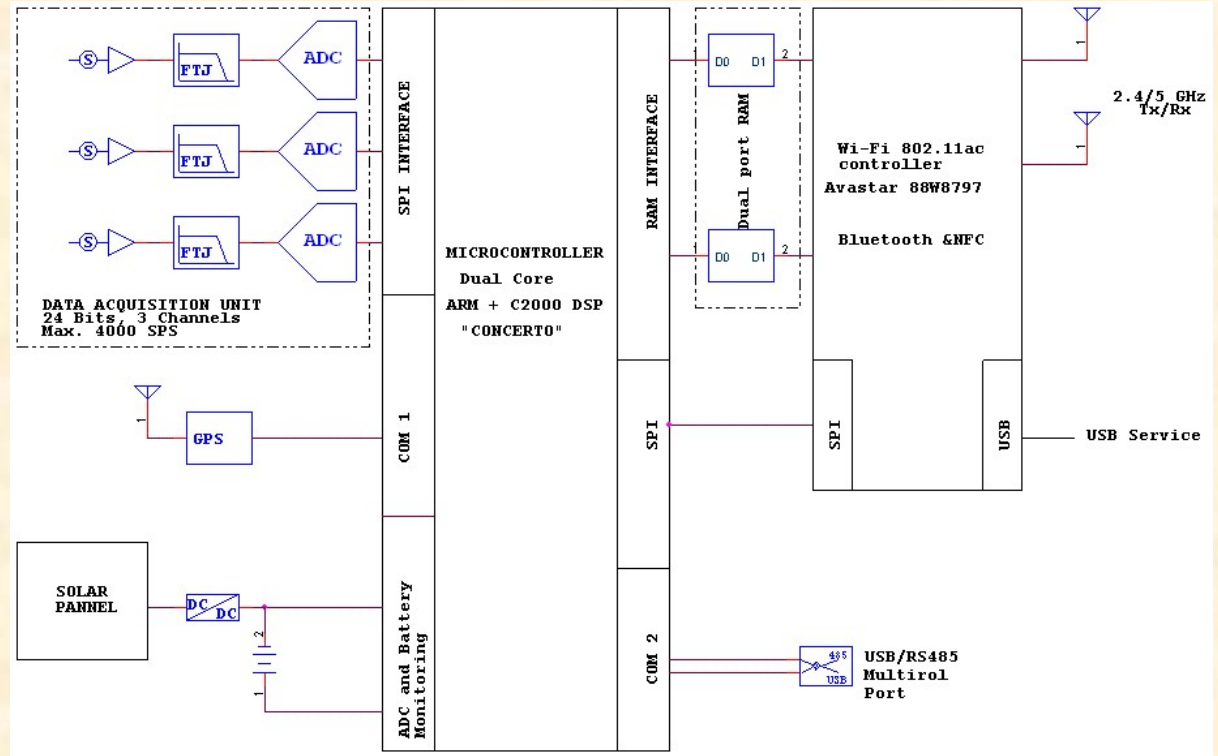
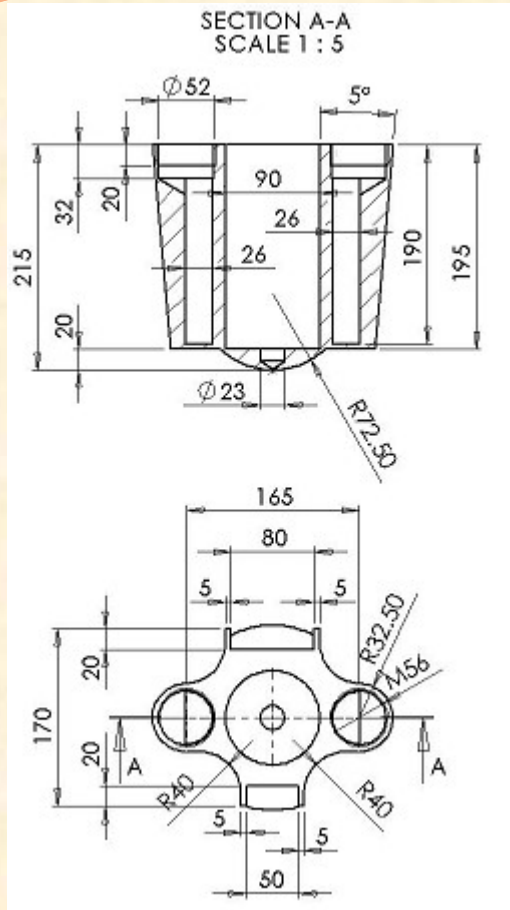


D524-FUNCTIONALITIES OF A WU (WIRELESS UNIT)

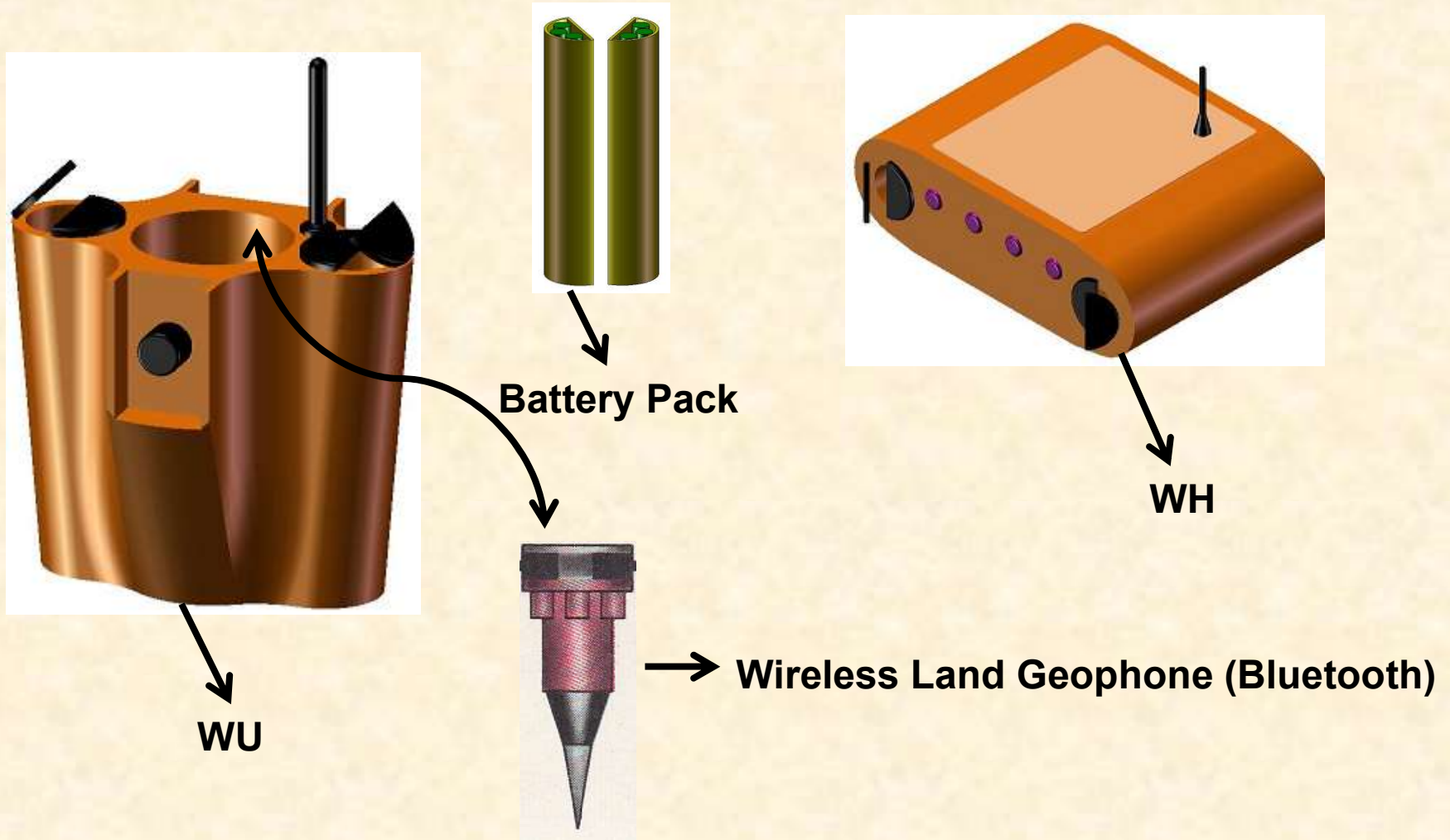
- In each WU would be in fact two parallel processes running during the seismic data acquisition, called a sweep that typically lasts 15 to 30 seconds:
 - PROCESS 1: The data acquisition including the ADC conversion;
 - PROCESS 2: The data transmission to the next unit
- Thus, WU acquires and digitizes 1 second (time frame) of seismic data and in the beginning of the next 1 second time frame, in parallel with data acquisition and digitizing, will transmit its own data/data of 3 previous WU's.



D524 - WIRELESS UNIT (WU) HARDWARE



D524 - WIRELESS UNIT (WU), WIRELESS HUB (WH) AND WIRELESS GEOPHONE (WG)



D524 - WIRELESS GEOPHONE (WG)

Wireless Land Geophone (WLG)

