

Standardizing data transfer from bio-logging sensors

From sensors to databases: A user perspective



In the 'old' days ...

- 1 project – Tracking of moose in one single area
- 1 tag/sensor provider
- Few tags/sensors
- Rare data delivery events
- Local data storage
- => manual data handling possible ????

Today: Moose movement research in Sweden

- Several ongoing projects
- 6 tag providers
- 836 tags
- Sensors for GPS, acceleration, heart freq, body temperature, proximity
- Delivery: several times/hour 24-7
- A 'normal' day:
 - > 600 data deliveries (SMS, text files, emails etc.)

Delivery methods

Network	Delivery	VAS	FIT	MTI	TS	Lotek	TVS
GSM	Email attachment	X	X			X	X
GSM	SMS	X				X	
Iridium	Email attachment	X					
ARGOS	Email body (ArgosDirect)			X			
Cable download	Text-file -> Email attachment	X			X		X

- 6 Providers, 7 formats, 3 delivery methods
- Some delivered files are encrypted
- Different formats: Date, time, type of information

Encryption

```
From: argosdirect@cds.fr
To: Hajoer Dertzi
Cc:
Subject:

04245 061104 22 17 L A 2011-02-23 10:01:05 64.195 17.405 0.350 401679555
2011-02-23 10:00:05 1 01 25 00 60
6408 00 20 5490
05 256 63 62
00 04 2048 00
00
2011-02-23 10:01:06 1 23 06 00 00
00 00 00 00
00 104 27 07
00 00 00 00
00 00 00 96
27 08 00 00
00 00 00 00
00 100 27 55676
2011-02-23 10:02:05 1 23 09 00 00
00 00 00 00
00 100 27 10
00 00 00 00
00 00 00 104
27 00 00 00
00 00 00 00
00 00 00 18378
04245 061115 31 32 A 0 2011-02-23 09:07:17 64.456 19.282 0.293 403675774
2011-02-23 09:03:16 1 21 11 00 64
<mailto:argosdirect@cds.fr>
```

ARGOSDirect email: Manual parsing
needed by propriety software!

Data deliveries - examples

From: TVP - Tellus <tellusdata@televit.se>
To: Holger Dettki; GpsData
Cc:
Subject: Tellus data from T3H-3052

Message T3H-3052_2011-02-21_100109.txt (768 B)

Q0001_675D1509_201102_210011.txt - Notepad

File Edit Format View Help

T30001

<IDENTIFICATION>
SN: 675D1509
Nick: q00011

<INFO>
Downloaded via: cellular
System: PC
Created: 2008/01/26 10:18:03
First date: 2008/01/02 00:27
Last date: 2010/01/26 09:00
Count data: 9
Last position: 0:00:00.00 0:00:00.00 0

Message:

<DATA>

Day Time	ID	REF	Lat	Long	altitude	maxsvr	hdop	vdop	satt	vs	vd	TE	TD	GS	AS	LS
2008/01/02 00:27	1	125	0:00:00.00	0:00:00.00	0	0	0	0.0	0.0	0	0	3.10v		24.93		
2008/01/02 00:47	2	43	0:18:14.70	29:18:50.00	74	48	1.0	0.0	8	1.47v		1.82				
2010/01/21 0:00	3	43	0:18:14.47	29:18:49.22	33	44	1.0	0.0	8	1.47v		-3.84				
2010/01/21 18:00	4	43	0:18:14.33	29:18:49.07	74	47	1.7	0.0	6	1.47v		-5.00				
2010/01/21 21:00	5	59	0:18:14.27	29:18:50.11	60	45	1.3	0.0	7	1.47v		-1.25				
2010/01/26 00:00	6	93	0:18:14.49	29:18:49.54	37	46	1.3	0.0	5	1.47v		-3.44				
2010/01/26 03:00	7	45	0:18:14.13	29:18:50.03	27	44	3.1	0.0	5	1.47v		-3.73				
2010/01/26 06:00	8	46	0:18:14.47	29:18:50.10	42	45	1.1	0.0	7	1.47v		-4.00				
2010/01/26 09:00	9	93	0:00:00.00	0:00:00.00	0	0	1.1	0.0	0	1.49v		1.06				

<END>

Ln 1, Col 1

Ln 1, Col 1

9.77
8.63
N/A 2'
4.06
1.83
3.06
3.80

My requirements as a researcher

- Easy handling of my sensor data
No fussing around with text-files, emails, SMS, json-streams etc.!
- Easy access to ALL my sensor data from DIFFERENT providers in ONE place
No manual copy/paste, merging, re-formatting of values!
- I need to understand what exactly is delivered to me – from my sensors or other dBs
All data must be documented and follow proper standards – time zones, map datum & projection etc....
- I need to store information about the use of the sensor on my animals

Solution

- All providers enable direct data delivery to a database (local dB or bio-logging dB)
- Metadata about the sensor (provider, type, version, etc.) is delivered to the dB
- All data/metadata packages are delivered in a standard machine-readable format
- All data values are formatted according to established, documented standards (vocabularies / dictionaries)
- Additional information about sensor-on-animal can be stored in a similar way