Columbia Basin PIT Tag Information System

Project 199008000

Response to ISRP Preliminary Review of Fiscal Year 2003 Mainstem and Systemwide Proposal

PIT Tag Information Systems

Columbia Basin

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Pacific States Marine Fisheries Commission

Project: 199008000

Columbia Basin Pit Tag Information System

Three aspects of the proposal should be clarified in the response:

Question 1. What is the process for obtaining metadata on data in PTAGIS and is the process adequate to ensure long-term usefulness of the data.

PTAGIS metadata is available at http://www.ptagis.org/Data_and_Reports.

Metadata is typically defined as “data about the data”. For most PTAGIS users, the information contained in the “Columbia Basin PIT Tag Specification” (the “SpecDoc”) provides adequate information that assures the long-term usefulness of the PTAGIS data set.

The PTAGIS project staff provides anecdotal information about facility operations in the course of normal operations and maintenance activities. Information in these archives include events such as power failures, PIT tag reader failures, separation gate failures and reference information related to operational activities of the Corps of Engineers transportation program. These “Event Logs” are available to anyone at www.ptagis.org/Ptoc_OM/event_log.

In addition to the SpecDoc and the PTAGIS Event Logs PTAGIS maintains an archive of “PTAGIS News Letters”. The newsletters provide information about various aspects of PIT tag research, data collection, system configurations, frequently asked questions and more.

A simple internet search reveals that there are many organizations working on application specific metadata standards. It is clear that much work has been done to define metadata standards for geospatial applications, information discovery systems and more. Most large software vendors sell ‘metadata solutions’ that address specific problem spaces.

The Columbia Basin PIT Tag Steering Committee (PTSC) develops the data standards to address the PTAGIS application specific problem space. In addition, other PTAGIS user constituencies provide the PTAGIS project with data, system, and other requirements. The SpecDoc is updated as new requirements are implemented in PTAGIS.

The PTSC data standards processes have been used for over fourteen years to provide context for the PTAGIS data set. These processes are robust enough to ensure long-term usefulness of the data. However, they can be improved and made more robust.

We recognize that additional project resources (staff and contractor services) will need to be directed toward providing even better data about the PTAGIS data in the future. We encourage PTAGIS data users to communicate ideas and requirements related to data standards directly with PTAGIS project staff or with a member of the PTSC.

Question 2. Methods were attached to specific tasks, but are too brief to allow scientific review. The methods should include references to written protocols or details should be provided in the proposal to ensure consistent operations in the future.

The tasks identified in proposal 199008000 are required to support the operational infrastructure of the Northwest Power Planning Councils Columbia River Basin PIT Tag Information System, PTAGIS. PTAGIS is an operations and maintenance project with an overall goal of collecting and distributing PIT tag data to any entities.

We will answer Question 2 by providing an overview of the PTAGIS subsystems, providing details of key sub-systems that are required to verify the integrity of the PTAGIS data being collected continuously, and listing key systems, descriptions and further references. These systems and subsystems have provided consistent and reliable operations of PTAGIS since 1993 and additional enhancements will provide even higher levels of consistent operations in the future. References to much of what is described below were provided in the original proposal.

OVERVIEW OF PTAGIS SUBSYSTEMS

Our methods are based upon monitoring and reacting to many different types of system events. The following illustrates some of the key sub-systems that are used to operate, monitor, evaluate and maintain PTAGIS. For quick descriptive reference to the subsystems listed in Figure 1, please refer to Table 1.

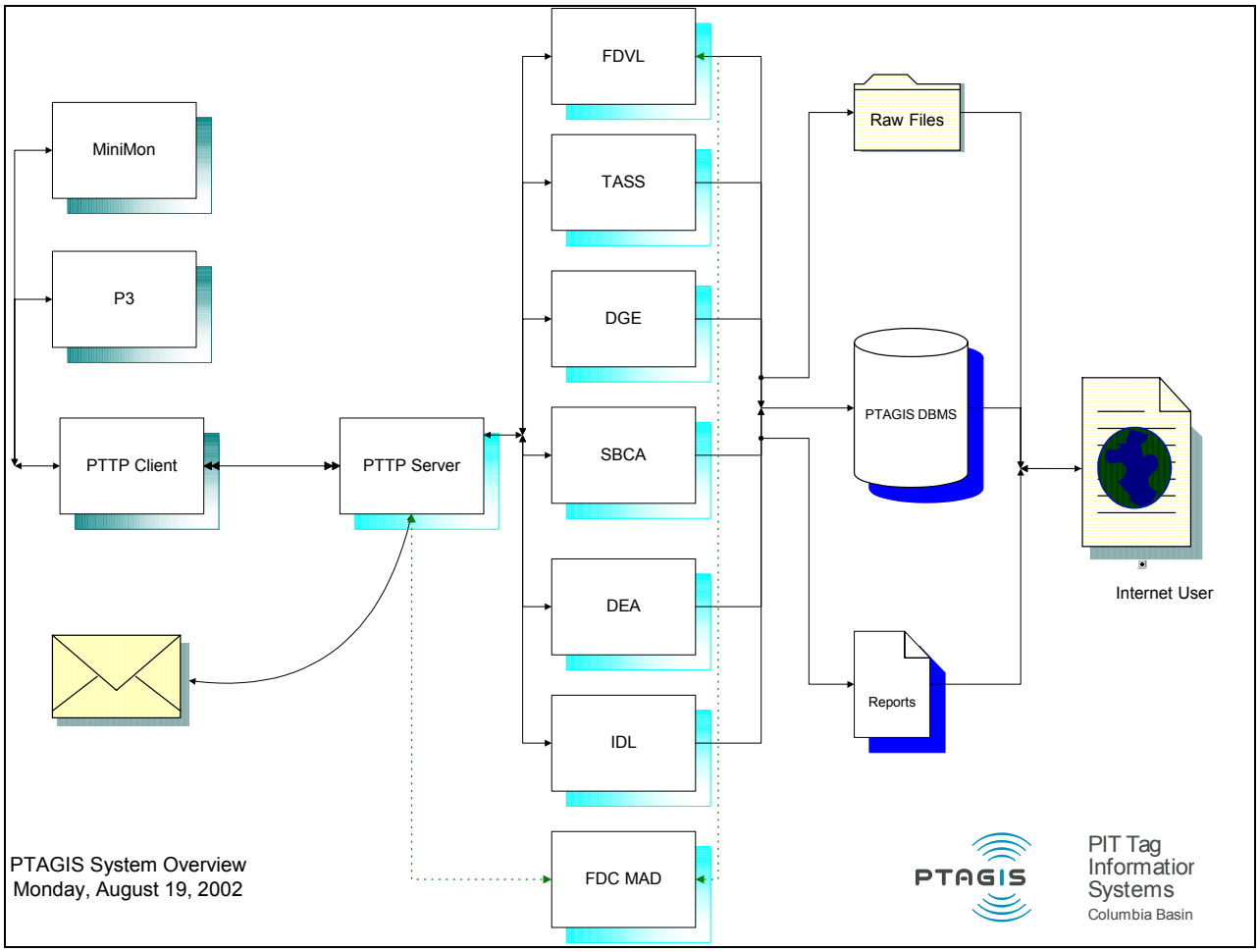


Figure 1 - Overview of Key PTAGIS Subsystems

As discussed in Question 1, the PIT Tag Steering Committee has established the data input definitions and requirements for PTAGIS as documented in the "Columbia Basin PIT Tag Specification". This document describes file definitions, code lists, site configurations and an overview of the PTAGIS database entity relationship diagram. It is required reading for any user of the PTAGIS data set. The following discussion assumes the reader is at least somewhat familiar with this document.

Client Side Data Submission

The boxes labeled "MiniMon", "P3", "PTTP Client" and the envelope icon on the left side of figure 1 correspond to the collection, validation and submission of PIT tag data to PTAGIS.

MiniMon (and MultiMon) are complex programs that run on personal computers that are used to monitor PIT tag transceivers and Programmable Logic Controllers located at detection facilities throughout the Columbia River Basin. These monitoring programs operate in a 'lights-out' environment, and create multiple files a day. These "Interrogation Files" conform to the "Spec Doc"

definitions, and contain not only detection data about PIT Tagged fish, but other system information that is used by the PTAGIS subsystems that will be described.

P3 is a program that runs on personal computers. It is used to collect information about fish as fish are captured (or recaptured), marked with PIT tags (or other tags), and released. Besides mark and release information, P3 collects morphological information such as fish length, fish weight, de-scaling information, etc. P3 creates the “Tagging” file as defined by the “Spec Doc.”

The “PTTP Client” is used to submit the tagging file to PTAGIS. A special protocol is used to communicate file load status information between the PTAGIS server system and the client’s personal computer. The result of the file submission process is cataloged on both the client and the server. These results indicate information such as the number of times this file was submitted by a user, the number of tagging, recapture mortality, duplicate or other records loaded. In the event that the PTAGIS server processes rejected the file based upon validation failure, appropriate information is communicated to the user. P3 incorporates all validation logic explicitly or implicitly defined in the “SpecDoc."

The “envelope” icon represents electronic mail. Some users prefer to submit PTAGIS data via electronic mail, rather than by way of the PTTP interface. This is an old method for uploading data to PTAGIS but is supported for reasons of backward-compatibility.

Users that submit data to PTAGIS must be registered with the PTAGIS data center. User identifiers or e-mail addresses associated with PTTP submission or e-mail submissions are verified with registration information prior to any file processing. If data is submitted from an un-registered user, the data is rejected and the user informed that (s)he must register.

Server Side Data Validation and Loading

The “PTTP Server” process is responsible for collecting data submission information from registered sources and dispatching the associated transactions to the appropriate process. In addition, PTTP server dispatches messages from the appropriate processes back to the source of the submitted information.

Tagging and Release Information

If a Tagging file is accepted for processing by PTAGIS, the Field Data Validation and Loading (FDVL) process is started automatically. (A detailed description of FDVL is provided in fdvl_documentation.pdf). FDVL is primarily responsible for assuring that all data submitted from a user is 100% valid – that is, in complete conformance with the “SpecDoc” – and successfully loaded into the PTAGIS database. The “raw” file that was successfully submitted by the user is also archived and made available via the internet. As stated before, PTTP is responsible for communicating the status of the submission request. Either the

file(s) loaded successfully, or the file(s) contained errors, need to be corrected and re-submitted.

Any person can monitor the acquisition and validation of tagging information in PTAGIS by reviewing either the "Raw Tagging Files" located at www.ptagis.org/Data_and_Reports, or viewing the FD load summary information at http://www.ptagis.org/Ptoc_OM/obs_file_status.

Interrogation Information

If an Interrogation file is accepted for processing by PTAGIS, the Interrogation Data Loader (IDL) process will load it when invoked for the next batch run. (A detailed description of IDL is provided in idl_documentation.pdf). IDL is primarily responsible for validation and loading of interrogation data. However, when IDL runs, several other processes run that analyze the PIT tag information from an operations and maintenance perspective. We will describe more about this in a minute.

Interrogation data is valid if it not only conforms to the "SpecDoc", but the interrogation site where the data is being collected is correctly configured within PTAGIS (for additional information on site configurations, see scm_documentation.pdf). Current and historical site configurations are tracked by PTAGIS. See Current and Historic Coil & Monitor Configurations at http://www.ptagis.org/Ptoc_OM.

As part of processing interrogation files within PTAGIS, a record is made for each interrogation site of the open date and time and the close date and time for each interrogation file. The difference between the close date / time of a previous file and the open date / time of the next file indicates a problem with the detection system computers at an interrogation site. Any "data gaps" in the data set can be viewed by anyone at http://www.ptagis.org/Ptoc_OM/obs_file_status.

Any "data gaps" are investigated as matter of course, in line with the PTAGIS Field Operations and Maintenance Standard Operating Procedures (see: http://test.pittag.org/doc/Field_OM.pdf). Typically, a gap will be identified in a file submitted by the "Primary" data collection computer located at the interrogation site. However, because of system redundancies, the "Backup" computer will usually have the missing part. Patching the gap is a manual procedure.

Figure 2, illustrates a couple of levels of redundancy employed by PTAGIS in the operation and maintenance of PIT interrogation sites in the Columbia Basin. First, notice the Primary and Backup PC's that provide data collection redundancy for the entire site. Second, notice that two ISO transceivers (Xceivers) are installed at a single monitor location proving not only redundancy, but capability to provide statistical analysis of the efficiency of one of the coils within the monitor using data collected at the other coil within the monitor. Third, notice that the remote system can be monitored – real time – either from PTAGIS

operations and maintenance facilities in Kennewick, WA or from PTAGIS offices in Gladstone, OR.

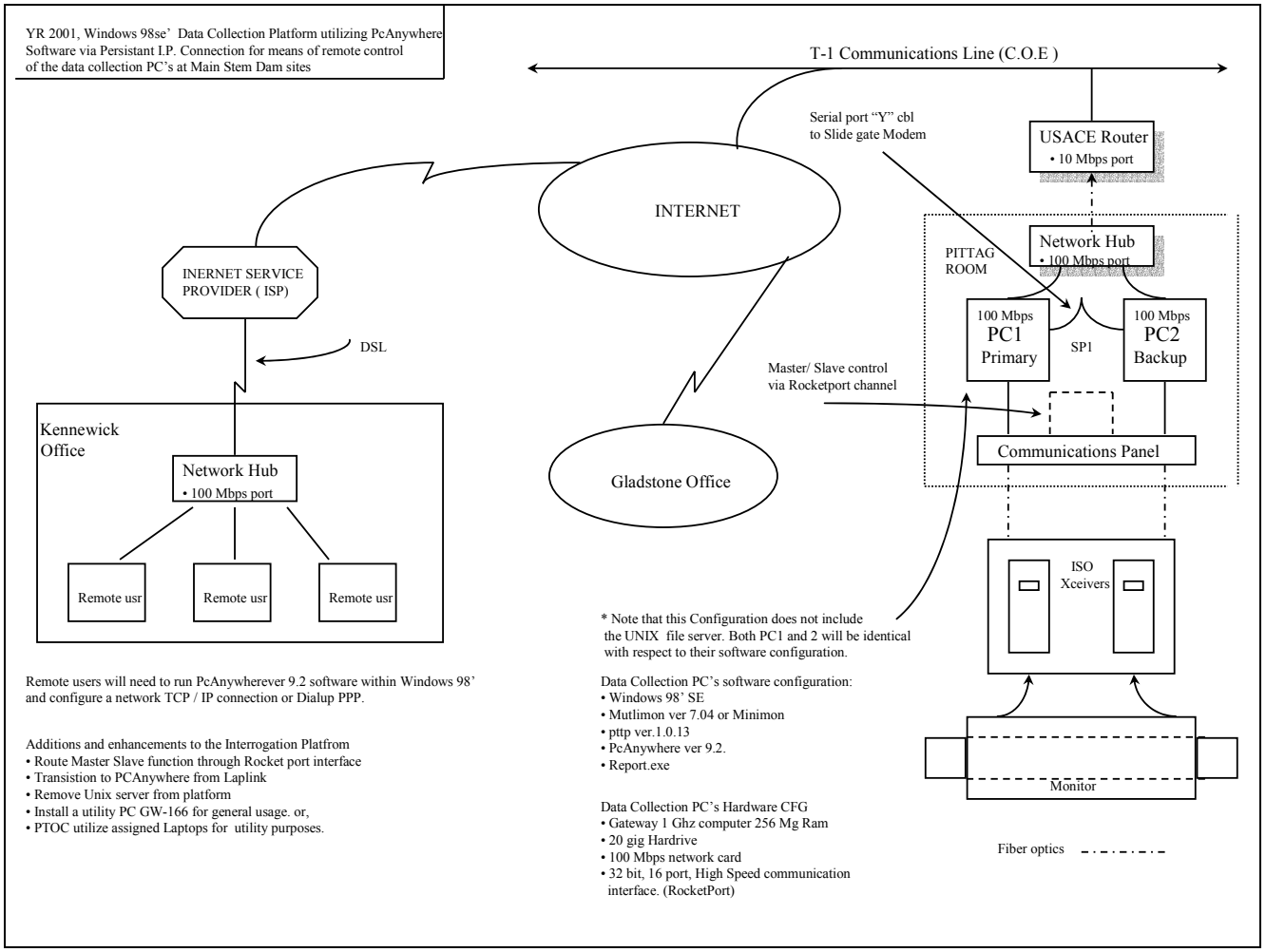


Figure 2: PTAGIS System Redundancy

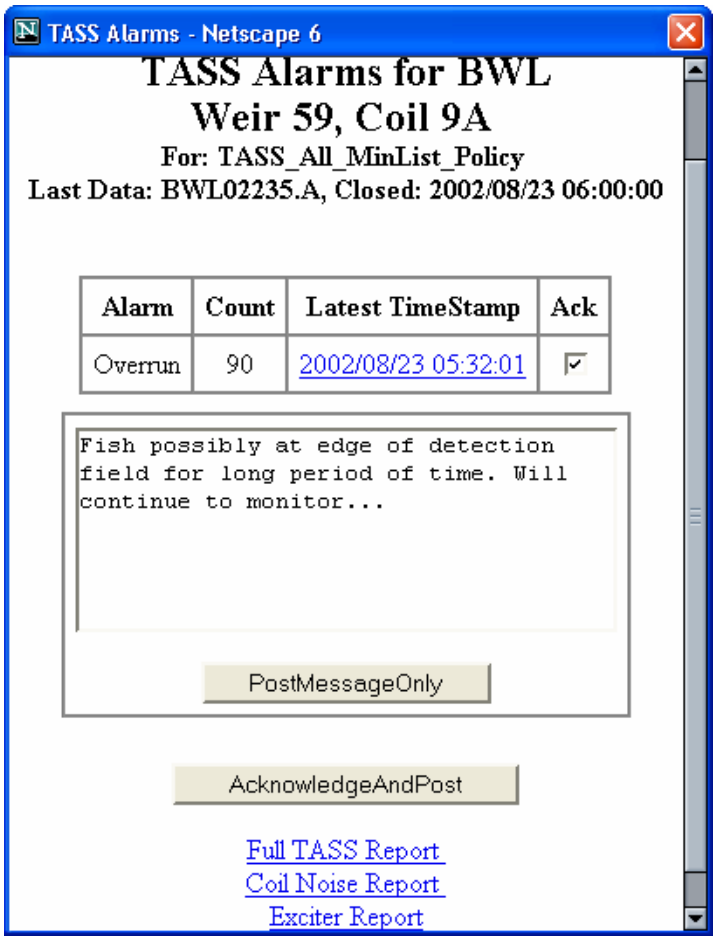
PTAGIS also employs an automated system to alert us when we have not received a file from an interrogation site for more than 6 hours. Our staff can then employ remote trouble-shooting methods via the internet to repair a problem, or a staff person is dispatched to the interrogation site to repair the problem.

Detection System Monitoring

As data from an interrogation site is validated and loaded other PTAGIS process inspect and analyze the data in order to identify potential issues that could relate to degraded detection efficiency at the interrogation site. A number of methods are used to perform these analyses. These methods include monitoring each interrogation transceiver for diagnostic anomalies and monitoring for the *absence* of 'fixed reference' tags (also called timer tags). In addition, direct and indirect methods are used to determine the efficiency of each PIT tag interrogation coil.

Monitoring Transceiver Diagnostics

There are over 300 PTAGIS supported interrogation coils (one transceiver 'drives' one coil or antenna) within the Columbia River Basin. The Transceiver Analysis System and Statistics (TASS) subsystem monitors diagnostic messages from each transceiver as interrogation files arrive and are dispatched by the PTTP Server. This is available on the internet to PTAGIS O&M staff at http://www.psmfc.org/pittag/maint_op/TASS/TASS_All_MinList_Policy_Annunciator.html .



TASS provides a visual user interface for use by the PTAGIS staff to provide alert information from any transceiver at any interrogation site. This is illustrated in Figure 3. This user interface utilizes a red light / green light system to alert PTAGIS O&M staff of potential problems with any transceiver / coil at any interrogation site. The O&M staff can click on the associated red light and view details of the red light event.

After corrective action has been taken, PTAGIS O&M Staff document any action taken and submit it to the "Event Log".

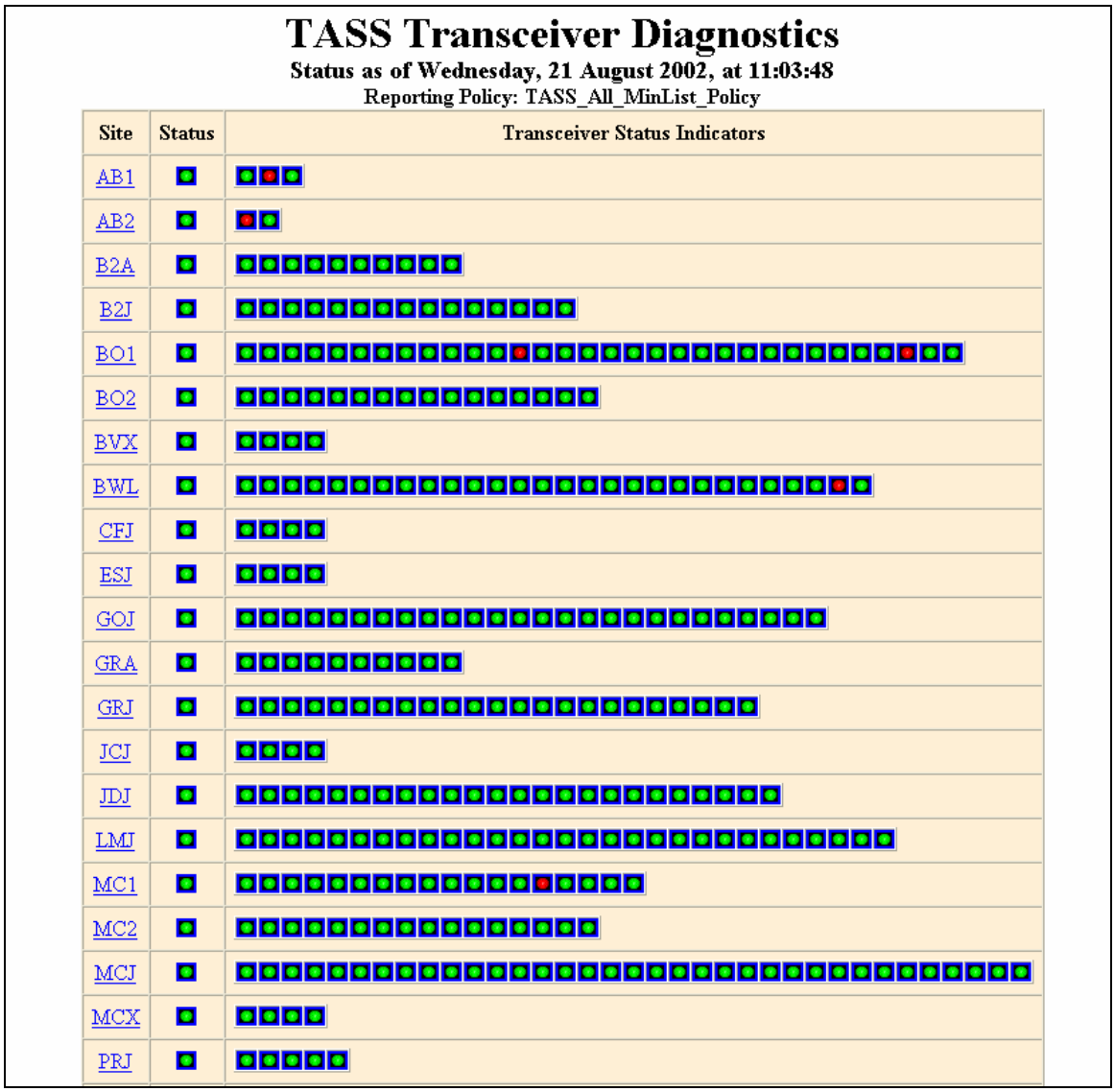


Figure 3: TASS Coil Diagnostics

In addition to providing alert triggers based upon transceiver diagnostics, TASS also generates graphical 'strip-charts' of key transceiver parametric information. By reviewing the trends depicted on the strip-charts, potential problems can be identified based upon a given trend. Quality control standards for operation of the PIT tag detection transceivers are provided by the Manufacturer, Digital Angel Corp (DAC).

Monitoring Fixed Reference Tags

A specialized PIT tag is associated with each interrogation coil throughout the system. These fixed reference tags are usually called timer tags, because they are triggered automatically every four hours (or as programmed by PTAGIS O&M personnel).

Every interrogation file should contain at least one timer tag for each coil at an interrogation site. The absence of a timer tag record for a given coil indicates a potential problem. Each time the IDL process runs, a Timer Tag Exception report is created that lists any coil that has not read a timer tag. O&M action may be necessary in this event.

Timer tag data is stored in the PTAGIS dataset for future reference. The presence of continuous timer tag information is a good indication of the continuity of the data set for each coil throughout the system.

Direct Methods for Determining Reading Efficiency of a Coil

Periodically, especially at season startup, and then throughout the migration season, PTAGIS O&M personnel drop 'test stick' into the fish pathways at interrogation sites in order to obtain a direct measurement of the reading efficiency of each coil. The test sticks are simply small wooden dowels that contain a known, pre-registered PIT tag. Usually twenty stick are dropped into the flume and recovered. A direct measurement of the number of detections of each stick at each coil can then be made. Since all of the test sticks are pre-registered with PTAGIS, we can generate a report of each 'stick test' performed at any coil at any site in the system since 1993. This data helps to assure the continuity of the data set and the general 'health' of the detection coils over time. This data is available by viewing http://www.psmfc.org/pittag/Data_and_Reports/stick_tag_reports . PTAGIS O&M personnel record a stick test in the PTAGIS Event Log.

Indirect Methods for Determining Reading Efficiency of a Coil

The method described in earlier work1 by NMFS FWP Project 1983031900, is still used by the PTAGIS project to provide day to day, week by week and seasonal detection efficiencies of each PIT coil in the Columbia Basin.

This method assumes there is a detection monitor composed of multiple coils in sequence with fish passing non-volitionally from the first coil through the last coil. The detection efficiency of each coil can be derived by counting the number of fish detected on other coils within the monitor, but not counted on the coil being assessed.

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[1] **"**A Study to Determine the Biological Feasibility of a New Fish Tagging System", 1989 Annual Report, U.S Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, and National Oceanic and Atmospheric Administration. Prentice et al. March 1993; Appendix B: Statistical Method of Determining PIT-Tag Coil Reading Efficiency, pp. 140-144. By Benjamin Sanford

The PTAGIS process that implements this method is referred to as the "Cumulative Efficiency Analysis", CEA. CEA is run each time IDL runs. PTAGIS O&M staff monitor CEA output daily.

CEA reports are available at the Cumulative Monitor and Coil Efficiency History at www.ptagis.org/Data_and_Reports. An example of the CEA output follows:

```
-----------------------------------------------------
     Pacific States Marine Fisheries Commission
            PIT-TAG INFORMATION SYSTEM
      Cumulative Detection Efficiency Analysis
                   version 2.0
-----------------------------------------------------

Report generated on 19-aug-2002 09:00:25
for tags meeting the following criteria:

       obs_site = 'GRJ'
   AND obs_date >= date('1/1/2002')
   AND obs_date < date('12/31/2002')


LOWER GRANITE DAM JUVENILE, DIVERSION / SbyC GATE
-----------------------------------------------------
                   TOTAL  MISSED  ESTIMATED EFFICIENCY
                   -----  ------  -------------------
Individuals:       62037
           Coil C1 60672    1365        97.80%
           Coil C3 61017    1020        98.36%
           Coil C4 60783    1254        97.98%
           Coil C2 60857    1180        98.10%

The number of fish seen on 1 coils =    145
The number of fish seen on 2 coils =    457
The number of fish seen on 3 coils =   3470
The number of fish seen on 4 coils =  57965

The estimated probability of missing fish is :
      1.391e-005% +/- 1.565e-006% (at 95% confidence)
```

Cumulative Efficiency Report Example

The main limitation of this method is that fish must pass through a sequential set of coils. Therefore, this method cannot be used to determine the detection efficiency of fish as they pass through the adult fish ladders – that's a different problem that is addressed by the Adult Detection Efficiency (ADE) processes, reference in the summary at the end of this discussion.

Another limitation of this method is that it provides aggregated efficiency calculations over a certain amount of time. Another different method developed

by the PTAGIS project relies upon Statistical Process Control principles for. This method uses essentially the same calculation as described for CEA, but normalizes coil efficiencies on groups of twenty fish. A strip chart histogram is generated showing the change in detection efficiency over time, normalized in groups of twenty fish representing a single data point in the histogram. PTAGIS refers to this method as the (Instantaneous) Detection Efficiency Analysis (DEA). These strip-charts are available at http://www.pittag.org/maint_op/efficiency/coil_detail for registered PTAGIS users. An example of DEA output for a single coil at McNary Dam follows:

```
MCNARY DAM JUVENILE           (MCJ)
  Monitor Nbr:  5 -- RIVER-1 EXIT                          0.14 tag/min
    Coil: 81                          Mean (M) =  72.70%  Std Dev (S) =  21.62%
     +--------------------+-------------+-------------------------------------+
     |      End Time      |    Tags     |               Coil Efficiency       |
     +         Of         |    Per      +------+--------------------------------+
     | Detection Interval |   Minute    |  %   |+- M-3S       Mean(|)          100% -+|
     +--------------------+-------------+------+|                                  |+
      18-aug-2002 10:51:11  30.00 |***   100.00 |------------------------|==========B
      18-aug-2002 10:51:03 120.00 |*****  80.00 |------------------------|==B--------|
      18-aug-2002 10:50:53   0.00 |       90.00 |------------------------|======O----|
      15-aug-2002 09:27:04   6.12 |***    95.00 |------------------------|========O--|
      15-aug-2002 09:23:48 300.00 |*****  70.00 |-----------------------O|-----------|
      15-aug-2002 09:23:44 300.00 |*****  75.00 |------------------------|O----------|
      15-aug-2002 09:23:40 600.00 |*****  65.00 |----------------------O==|-----------|
      15-aug-2002 09:23:38 600.00 |*****  60.00 |--------------------O====|-----------|
      15-aug-2002 09:23:36 600.00 |*****  65.00 |----------------------O==|-----------|
      15-aug-2002 09:23:34 120.00 |*****  85.00 |------------------------|====O------|
      15-aug-2002 09:23:22 109.09 |*****  70.00 |-----------------------O|-----------|
      15-aug-2002 09:23:10 150.00 |*****  80.00 |------------------------|==O--------|
      15-aug-2002 09:23:02 240.00 |*****  80.00 |------------------------|==O--------|
      15-aug-2002 09:22:57 400.00 |*****  85.00 |------------------------|====O------|
      15-aug-2002 09:22:54 600.00 |*****  80.00 |------------------------|==O--------|
      15-aug-2002 09:22:52 300.00 |*****  70.00 |-----------------------O|-----------|
      15-aug-2002 09:22:48 300.00 |*****  85.00 |------------------------|====O------|
      15-aug-2002 09:22:43 200.00 |*****  90.00 |------------------------|======O----|
      15-aug-2002 09:22:37 400.00 |*****  75.00 |------------------------|O----------|
      15-aug-2002 09:22:33 600.00 |*****  65.00 |----------------------O==|-----------|
      15-aug-2002 09:22:31 400.00 |*****  45.00 |-------------O==========|-----------|
      15-aug-2002 09:22:28 400.00 |*****  35.00 |---------O==============|-----------|
      15-aug-2002 09:22:24 400.00 |*****  35.00 |---------O==============|-----------|
      15-aug-2002 09:22:21  70.59 |****   25.00 |-----O==================|-----------|
      15-aug-2002 09:22:04  63.16 |****   20.00 |---O====================|-----------|
      15-aug-2002 09:21:45 600.00 |*****  35.00 |---------O==============|-----------|
      15-aug-2002 09:21:421200.00 |*****  35.00 |---------O==============|-----------|
      15-aug-2002 09:21:40 600.00 |*****  65.00 |----------------------O==|-----------|
      15-aug-2002 09:21:38 200.00 |*****  85.00 |------------------------|====O------|
      15-aug-2002 09:21:31 133.33 |*****  75.00 |------------------------|O----------|
```

Instantaneous Detection Efficiency Analysis Example

The example above is interesting and useful. It shows that as the number of tags per minute increases, the ‘instantaneous’ coil efficiency decreases. The detection rates are high when fish rates per minute are more ‘normal’. This histogram is typical of a ‘grouping’ situation, where high densities of PIT tagged fish are forced (flushed) through a detector rapidly.

Other Methods for Monitoring System Operations

The Separation by Code system (SxC or SbyC) provides the capability of selecting individual PIT tags for collection or alternative diversion from normal passage routes. For example, a researcher would like one group of fish collected into a collection tank, one group directed to a barge for transportation and a third group of fish diverted to the river as part of a study design. PTAGIS project staff assigns the various disposition codes to each group of fish, program the MultiMon program at the detection site and monitor operations to assure that the researchers request is implemented.

Much of the code preparation and coordination process is manual and requires very close consultation with the requesting researcher. However, PTAGIS has implemented several methods that provide for automated monitoring and evaluation of the SbyC request. See www.ptagis.org/Ptoc_OM and click on SbyC Action Code Summary items for listings of the SBCA reports.

PTAGIS project staff also monitor and evaluate the day to day operation of the PIT tag diversion gate systems at bypass facilities. The operations and maintenance of the gate hardware and fish passageways is the primary responsibility of the U. S. Army Corps of Engineers according to a Memorandum of Agreement with the Bonneville Power Administration. However, the Diversion Gate Efficiency (DGE) software allows PTAGIS project staff to monitor gate operations. See http://www.pittag.org/Ptoc_OM and click the link Sample Rates and Diversion Gate Settings (DGE PCL Values). A description of the DGE process is included in dge_documentation.pdf.

Data Access

A shortage of PTAGIS project staff and financial resources has limited data access development efforts. However, over 100 users regularly use the PTAGIS telnet based application to generate over a thousand data sets per month. The data sets range in size from a few thousand bytes of data to nearly a half gigabyte data set. This user interface has been used since 1992 and has changed very little in the past five years.

Management information related to the number, types, and amount of data being requested has been collected since 1993. This management data allows us to monitor system usage and to evaluate options for improving system performance and improving our web based user interface.

Since 1995, PTAGIS data has been available on the internet. Generally, pre-computed reports and ‘raw’ data files are most readily accessible. Work is underway to improve the data access tools available on the internet.

SUBSYSTEM SUMMARY

The following table lists most of the key subsystems that have been developed by the PTAGIS project since 1993 in support of PIT tagging research funded by Bonneville Power Administration for the Northwest Power Planning Council's Fish and Wildlife Program:

Table 1: PTAGIS System Descriptions and Reference

#	Acronym	Subsystem	Description
1	ADE	Adult Detection Efficiency	Determines the PIT tag detection efficiency at adult ladders, weir by weir. See http://www.pittag.org/web/Adult See also ADE documentation.pdf
2	CEA	Cumulative Efficiency Analysis	Determines the PIT tag detection efficiency at monitors within the juvenile fish bypass systems. See: cea_documentation.pdf
3	DEA	Instantaneous Detection Efficiency Analysis	Determines detection efficiency changes over time intervals defined by arrival of 20 fish per computation. See: dea_documentation.pdf
4	DGE	Diversion Gate Efficiency Analysis	Determines PIT tag actuated diversion gate efficiencies at juvenile fish bypass systems. See: dge_documentation.pdf
5	FD	Field Data file upload information.	Collection of data structures populated by PTTP server, FDVL and IDL to track submission of files from PTAGIS data supplies. This data is used to identify disruptions to interrogation site data collection. See http://www.ptagis.org/Ptoc_OM/obs_file_status And http://www.psmfc.org/pittag/Data_and_Reports and click on Tag File Contents Summary.
6	FDA	Final Disposition Analysis	Translates low-level system codes into human readable descriptions of the last detection location of the PIT tagged fish.
7	FDVL	Field Data	Accept or reject Tagging Information Files (a.k.a.,

#	Acronym	Subsystem	Description
		Validation & Loader	PTAGIS mark, release, recapture and mortality information) based upon validation rules defined in the “Columbia Basin PIT Tag Specification Document”. Load valid data into PTAGIS, notifies users of data submission status.
8	IDL	Interrogation Data Loader	Validates and loads interrogation data collected at dams, traps, acclimation ponds, remote streams, etc.
9	MultiMon	Multi function monitoring program.	Product of FWP 1983031900, New Fish Marking Program from NMFS. Complex, DOS based software used at interrogation sites that require separation of PIT tagged fish by code (SxC).
10	MiniMon	PIT Tag Monitoring program	Monitors PIT tag interrogation system coils for passage of PIT tagged fish. Creates Interrogation files that conform to the PTSC’s Columbia Basin PIT Tag Specification document. See ftp://ftp.psmfc.org/pub/MiniMon/MiniMonSetup.exe
11	P3	PIT Tag 3 – Marking Station Application	Application program used by hundreds of users when marking fish with PIT tags. P3 creates Tagging Information files as defined by the Columbia Basin PIT Tag Specification document. See http://www.ptagis.org/P3
12	PAB	PTAGIS Address Book	Provides single source of information on PIT tag system users, advanced users, PIT Tag Project Sponsors, Tag Coordinators, etc. Integrated with Tag Distribution and Inventory (TDI) application. PTAGIS internal use only.
13	PITEvent	Interrogation Site Event Log	Entries of PTAGIS operations and maintenance activities at interrogation sites. Also includes anecdotal system events as reported by others related to facility operations that may impact facilities ability to detect passing PIT tagged fish. See http://www.psmfc.org/pittag/Ptoc_OM/event_log
14	PTAGIS3	PTAGIS User Interface (old,	Telnet based user interface that provide access to PTAGIS data. See telnet://telnet.ptagis.org

#	Acronym	Subsystem	Description
		character cell based)	
15	PTTP Server	PIT Tag Transfer Protocol on Server system	Provides acknowledgement of data submissions and queues transactions for FDVL and IDL processes.
16	PTTP Client	PIT Tag Transfer Protocol on client systems	PC client based application that submits of PTAGIS data and acknowledges processing by PTAGIS server systems.
17	SxC	Separation by Code	Collection of manual and scripted procedures to coordinate user requests for segregation of populations of PIT tagged fish at automated monitoring facilities. See MultiMon. See also, www.ptagis.org/Ptoc_OM and click on SbyC Action Code Summary items.
18	SBCA	Separation by Code Analysis Reports	Reports requested versus actual disposition of fish based upon MultiMon action identifiers. Analysis Reports
19	SCM	Site Configuration Management	User interface and data structures used to model the configuration of interrogation sites over time. See detailed DEA and IDL documentation.
120	TASS	Transceiver Analysis System Services	Provides a web based user interface for PTAGIS Operations and Maintenance personnel to monitor the status of all PTAGIS supported transceivers at any interrogation site. Provides access to coil specific Exciter Report and histograms.
21	TestTags	Test Tag Data Systems	Provides ‘heart-beat’ information about all PTAGIS supported transceivers in the system.

#	Acronym	Subsystem	Description
22	TDI	Tag Distribution & Inventory	Subsystem used to track FWP PIT Tagging project PIT tag distributions, purchases, BPA contract modifications for PIT tag purchases and available inventory.
23	VAL	System Validation Codes	List of validation codes for species, run, rearing type, release locations, interrogation sites, coil and monitor names, coordinator identifiers, etc. Approved by PTSC and incorporated into Columbia Basin PIT Tag Specification document.

Question 3. Quality assurance goals are specified but monitoring and evaluation of success should be given. A monitoring and evaluation plan must be given in this proposal. It is not appropriate for one of the most quantitative projects to not have a quantitative monitoring and evaluation plan for itself.

The PTAGIS project is comprised of a number of systems and sub-systems that continuously monitor system status of computers not only at the PTAGIS data center in Gladstone, OR, but of arrays of electronic instrumentation and other computers located at remote interrogation sites throughout the Columbia River Basin.

These systems, which are identified in the answer to Question 2, above, have been in service and have been evolving for the past ten years.

Our monitoring and evaluation plan is incorporated in the operation of the systems and system documentation described and referenced above. This plan has been guided by the best efforts of the Columbia Basin PIT Tag Steering Committee and the interpretation of the PTSC's intent by PTAGIS project staff.

A discussion of how to change the existing plan has been initiated with the PTSC.