HISTORION®

Personal Radiation Monitoring

WHITE PAPER

Further Information:

Contact	HISTORION® Sales and Support Cybermynd Information Systems Consulting Pty Ltd
Telephone	+61 3 9876 0323
Email	service@historion.com.au
Web	www.historion.com.au

Introducing HISTORION®

The Radiation Safety Officer strives to safeguard staff through a range of tasks such as training, observation of best practices and use of safety equipment, as well as monitoring and reporting of radiation exposure through dose readings.

This role is made significantly more effective when aided by specialised software with a range of tools, such as automatic high dose detection mechanisms and optimised utilities for managing and working with dose readings data.

HISTORION® was designed by Radiation Safety Officers, for use by Radiation Safety Officers. HISTORION® is monitoring provider independent; it imports exposure dose readings data from ARPANSA, Australian Radiation Services (SGS), Landauer Australasia and other third-party providers.

HISTORION® was prototyped and developed over a six year period with input from ARPANSA, CSIRO, the Victorian Government, Alfred Health, ACT Health and a wider group of prominent Australian hospitals and universities in New South Wales and Victoria.

As this White Paper explains HISTORION® will assist the Radiation Safety Officer or Radiation Specialist by implementing critical radiation safety tools to better protect staff through:

- ✓ Improved management of radiation exposure risk and dose budget
- ✓ Significant reduction in human error in radiation exposure reporting
- ✓ Remaining compliant with ICRP, ARPANSA and state regulator guidelines

Save time and money by;

- ✓ Realising substantial efficiency gains in radiation safety and monitoring tasks
- ✓ Realising substantial efficiency gains in exposure reporting and analysis
- ✓ Significantly reducing inefficiencies and human error associated with manual processing and collation of dose readings data

Additional product benefits include;

- ✓ An industry recognised system of dosimetry record keeping
- ✓ Extensive statistical reporting for radiation exposure research and study purposes
- ✓ Data management Registers for radiation safety devices, radiation assets and sealed sources

Better Manage Radiation Exposure Risk and Dose Budget for Staff

HISTORION® provides;

Radiation Exposure Monitoring and Exposure Budget Management

✓ A standard suite of alerts for elevated readings

✓ Staff pregnancy notification recording and monitoring features

✓ Customisable reading alerts for specialised sites, centres and research purposes

✓ Email-based notification of dose outliers and doses breeching exception limits

✓ Ongoing logging and retention of dose exceptions and alert notices

Badge Wearer Management Assistance

✓ Customisable staff summary exit letters and detailed exposure report templates

✓ File notes for tracking wearer consultation and badge administration tasks

✓ Comprehensive search screens; search by any dose report data criteria; i.e. sex, gender, age group, pregnancy, employment status and exposure levels

Wearer Licencing

✓ Wearer radiation licence file and wearer photograph import features

✓ Licence search, expiry and conditions recording and management functions

Manage Protective Devices

✓ Manage specialised register of protective devices such as lead aprons

✓ Conduct protective device safety assessments in accordance with AS/NZS 4543:2000

✓ Record planning, methodology and outcomes of cyclic attenuation tests and defects

Reporting

✓ Over 30 standard reports for OH&S, dose budget, admin, planning and research tasks

✓ Reports for staff exposure totals and annual averages

✓ ICRP rolling 5 year averages, graphs, charts, alerts and dose budget reports

✓ Reports comparing staff exposure by occupation to ARPANSA national results

✓ Flexible ad hoc and custom report design interface, including extensive graphing, analysis and Microsoft® Excel interaction capabilities

Interfacing to key Dose Reading Providers and Regulators

✓ An Australian National Radiation Dose Register (ANRDR) data submission tool

✓ Dose data import and validation functions, independent of monitoring provider (native support for ARPANSA, Landauer, ARS SGS and customisable 3rd party dose readings)

✓ Automatic data transfer interface for Landauer customers using Landauer's data portal

✓ External electronic file import for letters, reports or paper copy reading images

Enterprise Design and Deployment

✓ Manage wearers and dose readings by Site and by Business Unit structures

✓ Assign Radiation Safety management responsibilities into customisable roles by User, Centre, Site and Business Unit jurisdictions

Architecture

✓ Secure local Microsoft® SQL Server database to store radiation dose readings (local facilities or cloud based SQL Server database supported)

✓ An industry recognised system of record keeping for radiation exposure data

✓ Connection Tool for linking to multiple HISTORION® database instances

Manage Risk

HISTORION® assists in managing risk by assisting the Radiation Safety Officer to;

- Manage and use critical radiation exposure readings vital to executing radiation safety obligations and occupational health and safety imperatives under federal and state legislation.

- Compare against regulatory limits for radiation workers (20 mSv per annum averaged over 5 years with no more than 50 mSv received in any one year, as recommended by the International Commission on Radiation Protection ICRP) report year to date and annual totals and averages and rolling 5 year averages.

- Avoid longer term compliance issues, occupational health and safety issues and potential adverse legal outcomes and associated costs.

- Report aggregate radiation exposure levels for staff over time and identify any areas of important radiation protection practices that need to be addressed.

- Remove significant potential for human error; Radiation Safety Officers no longer have to laboriously work with dose report files using manual processes. Working with high numbers of transactions across high numbers of dose reports can result in high readings being missed or double counted, HISTORION® removes this risk.

Improve Efficiency

HISTORION® provides RSO's with significant efficiency improvements;

- Quickly and efficiently identify high radiation exposure levels for staff.

- Reduce time loss; Radiation Safety Officers currently spend countless hours opening multiple dose report data files to generate total dose reports for badge wearers.

- Eliminate potential for accidental change to, or loss of, radiation dose readings data. As dose report files are currently being opened and closed it is possible, even with due care, to accidentally permanently change or delete original dose reading data. HISTORION® eliminates this problem.

- Realise opportunities for automatically detecting high dose readings and calculating accumulated exposure to radiation using automated mechanisms.

- Introduce automated mechanisms, tools and accuracy required to efficiently pinpoint and respond to problem radiation dose levels.

Realise Benefits

Implementation of a local HISTORION® solution will ensure;

- That your organisation implements an industry recognised tool for local, reliable, dose level alert mechanisms (in particular for pregnant staff) in support of Work Health and Safety (WHS) obligations and state radiation safety legislation.

- That your organisation implements tools for local, efficient, ongoing monitoring of radiation protection practices and staff exposure levels;

  The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) publication "Personal Radiation Monitoring Service and Assessment of Doses Received by Radiation Workers" reports the annual extremity doses to occupationally exposed personnel.

  The HISTORION® software incorporates ARPANSA's national statistics pertaining to quartile, mean, maximum and average doses by Occupational Classification. This allows for direct comparison of occupational exposure to your organisation staff against reported National baseline doses and continual monitoring of the effectiveness of the organisation's radiation protection practices.

- That the Radiation Safety Officer and OH&S staff at your organisation have specialised tools (designed by Radiation Safety Officers for Radiation Safety Officers) required to proactively search for and report aggregates of, radiation exposure for any specified staff member or occupation demographic across medically significant (i.e. yearly) timeframes.

- That your organisation addresses the potential for insufficient recordkeeping - due to the manner in which (for historical reasons) the dose readings are being provided and extracted.

- That your organisation addresses the potential for insufficient recordkeeping - due to where and how (for historical reasons) the dose readings are being stored.

- That the long term custodianship of the records will be, appropriately, secured at your organisation.

- That your organisation complies with the Record Keeping requirements of ARPANSA's National Standard Limiting Exposure to Ionizing Radiation. The HISTORION® software will assist your organisation in compliance with section 14 (Record Keeping) of the standard.

Save Money

HISTORION® was built over a six year period, with prototyping and requirements input from Radiation Safety Officers at ARPANSA, CSIRO and many Australian hospitals and universities.

We have already committed more than six years of work-shopping and collaboration effort to the product. AusIndustry Research and Development funding has also contributed to the development.

The cost associated with developing a product like HISTORION® has already been funded for you, so developing and operating a custom tool for your organisation is no longer necessary.

As the following Cost Benefit Analysis below shows, HISTORION® will save your organisation in the order of $5,000 per year per 100 badge wearers.

Cost Benefit Analysis

Methodology

The Cost Benefit Analysis for this Business Case equates cost benefits by using hours of effort by costs per hour for Radiation Safety Officers.

The analysis comparing time spent executing tasks without against time spent with the use of the HISTORION® software for an example group of 100 radiation monitor wearers. Results can logically be directly extrapolated out to higher numbers of wearers with straightforward multiplication.

The timeframe measurement for producing a total dose report for a wearer is based on anecdotal advice and estimates from Radiation Safety Officers themselves. The following calculations use conservative, rounded numbers to illustrate cost benefit outcomes.

Radiation Safety Officer annual salary:	$100,000 to $180,000 (different qualifications)
For purposes of this analysis we use:	$120,000
Equates to approximate hourly rate of:	$62.50

Theoretical Case

Survey data from Radiation Safety Officers advises that it currently takes in the order of one hour to produce a total dose exposure report for one wearer without HISTORION®.

Note that it is recognised that this timeframe is usually longer and in the case of pregnant staff members is a more involved and detailed process. Radiation Safety Officers create total dose reports by working through each dose report data file, collating total exposure readings and in the process must navigate:

- Hundreds of rows of dose readings data
- Control monitors
- Incorrectly warn badge results and notices
- Over-exposed badge results
- Anomalous readings
- Missing, lost, damaged and not worn badges

If one total dose report were produced for each wearer, once per year, the cost without using the HISTORION® software would be: $6,250 per 100 wearers ($62.50 rate x 100). The HISTORION® software license costs: $660 (based on $6.60 p.a. x 100 wearers). The cost of the HISTORION® software remains fixed regardless of the number of reports run from the system and regardless of the number of local workstations running the product.

The Final Equation

Outcome

The time taken to produce an aggregate dose report with the HISTORION® product using very conservative numbers is approximately 6 minutes from start to finish of process encompassing; generate report with parameters, export to pdf, check results, draft and send email to nominated recipient with report attachment.

If a total dose report were produced for each wearer, once per year, the time using the HISTORION® software at 6 minutes per wearer is 600 minutes (10 hours x $62.50 rate) = $625 which added to the license cost for the software $625 + $660 = $1,285 in total.

Total saving: $6,250   for 100 wearers without HISTORION® (current)
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                          $1,285   for 100 wearers using HISTORION® (proposed)
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$4,965 cost saving per 100 wearers per annum*
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* Note the result shown does not cater for any local or cloud-based IT/hosting costs, which vary

Implement Reliable Technology

The HISTORION® software comprises two parts; a Microsoft® SQL Server (2008 or higher) database repository and PC Desktop installed software, to be installed on required workstations at your organisation.

The project will require space and memory on an existing Microsoft SQL Server or a cloud-based implementation which we will provide for you.

The project may require engagement of local IT services to identify and make available a Microsoft SQL Server for installation of the HISTORION® repository if a local server is to be used. The project may require engagement of local IT services to install the HISTORION® PC Desktop software and setup database connection details on identified workstations.

The HISTORION® solution uses a basic client-server physical model as shown below;
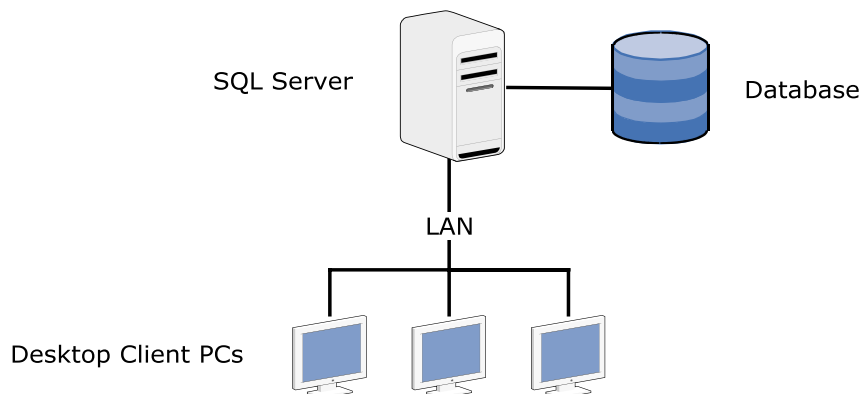
HISTORION® solution architecture key points;

- HISTORION® client software is installed on local Windows PCs or Laptops

- HISTORION® databases are hosted on a local Microsoft SQL Server you provide unless a cloud based model is adopted.

- Connection settings to a target HISTORION® SQL database are either stored in the Windows Registry on each PC, setup by the HISTORION® Connection Tool or are provided in a local .ini file if Registry use is problematic

- There are no server-side executables or services of any kind to be installed

- The SQL Connection is direct to the server (not via proxy or other relay)

- The HISTORION® software can use SQL Server Authentication if required however we recommend using Active Directory Integrated Security.

Installation Requirements

System Environment

- PC or Laptop with minimum 4GB RAM
- Microsoft® Windows 7 or higher (see below re Windows XP)
- Microsoft® Office 2003 or higher
- Microsoft® SQL Server 2008 R2 or higher (Express editions supported)

Microsoft® SQL Server Requirement

We have elected to base HISTORION® on the Microsoft SQL Server database platform, instead of any desktop database technology, for storing all of your radiation dose readings.

This decision was made, importantly, for the security of radiation dose readings data and for system performance and load reasons. Some of our customer sites have hundreds of thousands of dose readings. This means that a scalable database environment (like SQL Server) is necessary.

Microsoft provides SQL Server Express as a free download on its web site.

Local Admin and SQL Server Admin Login

- To create new HISTORION® database connections using the Windows Registry option requires local administrator rights including write access to the Windows registry for connection details
- To create new HISTORION® database connections requires an SQL Server Login
- To add a new HISTORION® database requires an SQL Admin Login.

Thank You!

HISTORION® was developed over a six year period that included extensive industry consultation and software trialling.

We wish to give particular thanks to our collaborative partners for their time and testing effort during our consultation period:

- Alfred Health (encompassing Prahran, Caulfield and Sandringham hospitals)
- ACT Government Health and Canberra Hospital and Health Services
- The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)
- The Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- The Victorian Government
- Prince of Wales Hospital
- Landauer Australasia