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# Control Point: An Electronic System for Replacing Hard Copy Forms in Accountable Nuclear Material Transactions

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## **ABSTRACT**

The Oak Ridge National Laboratory (ORNL) Nuclear Material Control & Accountability Team (NMC&A) has traditionally used hard-copy forms to capture changes in the amount of accountable nuclear material in a Material Balance Areas (MBAs) due to transfers, mixes, splits, etc. This approach was labor-intensive and time consuming, as hand-written signatures needed to be captured on a triplicate form and returned to a Material Balance Area Representative (MBAR) before work could be performed. As part of the laboratory wide response to COVID-19, a team

was formed to create the Control Point software application. This application shifts processes for recording accountable nuclear material transactions to an electronic system. It was developed using modern Agile software engineering practices and was deployed into production use at the beginning of 2021. This paper will discuss the design process for the Control Point application, the benefits in efficiency gained through its use, and the fundamental principles of Nuclear Material Control and Accountability codified in its programming.

## **CONTROL POINT**

### OVERVIEW

ORNL's NMC&A must consistently develop, review, and maintain accurate nuclear material accounting records to support local, national, and international commitments. The team is responsible for accurately reflecting the nuclear material inventory for the site and ensure sufficient controls and data integrity is maintained. They must maintain a complete audit trail of the lifecycle of all accountable nuclear material, which requires them to document changes in the site's nuclear material inventory due to shipments, receipts, transfers, changes in physical form, chemical/isotopic composition, location, and adjustments. NMC&A works closely with MBARs to accomplish these tasks. ORNL is structured such that MBAs are used as the basis of the accounting structure, where MBARs are responsible to account for nuclear material in their respective MBA. MBARs submit nuclear material transactions to NMC&A for review and approval by way of various paper forms. NMC&A must then review and approve each of the transactions captured on the forms and accurately record them into the Local Area Nuclear Material Accounting System (LANMAS) within a defined timeframe and provide data and reports from this system to the National Material Management Safeguards System.

NMC&A has begun taking steps to enhance these nuclear accountancy processes via software, which will also enhance the safeguard and security of nuclear material. The effort began with the NMC&A team and the Mission Applications Group working together to create a software application to manage intra-laboratory transfers of nuclear material during the COVID-19 pandemic. These transfers have historically been handled using a paper form referred to as the ORNL-2681, where the information was hand-written on the form which was then passed to the appropriate authorities for review and approval signatures. Several inefficiencies existed in this process, including but not limited to:

- Time and cost to review, edit, process, and submit hard copies;
- Time and cost involved in obtaining written signatures, particularly where individuals work in different locations and have limited availability (the COVID-19 pandemic, it was particularly difficult to obtain authorization signatures on these paper forms);
- Time and cost of 2-factor approval for Special Nuclear Material transactions;
- Time and cost to file official documentation, then manage and retrieve the paper forms;
- Time and cost to process end of month reconciliations;

- Office space required to store records per moratorium requirements;
- Readability issues with hand-written data resulting in transcription errors;
- No data validation occasionally resulted in erroneous information being submitted;
- Inconsistencies in how MBARs recorded data, such as how weight values were rounded, how isotopes were identified, etc.

The new software was intended to surmount these shortcomings and provide a more efficient and reliable means of managing the process. It was further desired that the application be built in such a way as to allow for growth and integration with other NMC&A software anticipated to be created in the future to aid in other NMC&A business processes. The resulting software application is referred to as Control Point.

The Control Point application is in its infancy, currently on version 1.0.2. The initial release was intended to manage the intra-laboratory transfers and overcome existing shortcomings. The application has streamlined and improved efficiency, reduced transcription errors, made nuclear material accountancy data more sustainable and readily available, and electronic authorizations can now be done by authorized personnel from any computer with access to the application. It has produced results which have paid for its development efforts in time-savings, with MBARs having reported saving 2% to 20% of the time it takes them to request transfers, and the NMC&A Team reporting saving approximately 20% of their time in processing and storing the requests. Data consistency has increased dramatically, and no rounding or isotope issues have been reported since the software was first released to production.

The application is intended to grow into a suite of software modules to aid in other NMC&A business processes, and the development of these tools are currently being planned.

## GENERAL FUNCTIONALITY

The Control Point application was built with the future in mind. The landing page is presently a blank page intended to someday serve as a dashboard housing informational tiles, charts, and indicators which will provide pertinent data and quick access to frequently used features in the application. Figure 1 below shows the landing page as it exists today, and Figure 2 portrays a concept utilizing tiles, charts, and indicators which may be developed in the future.

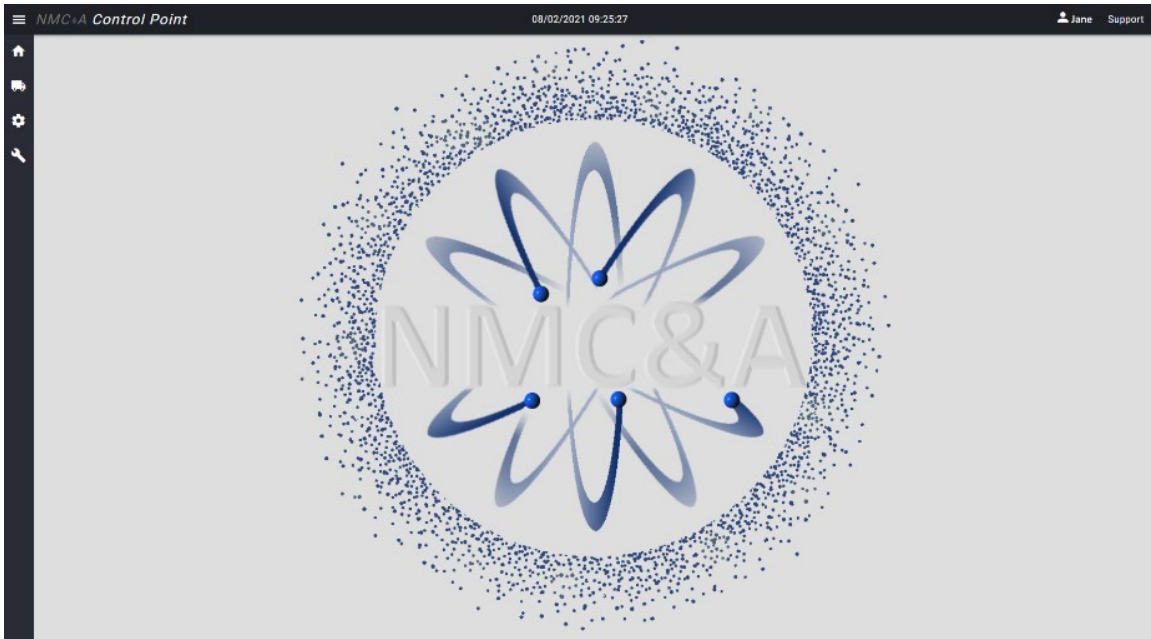


Figure 1: Current landing page for the Control Point software application.

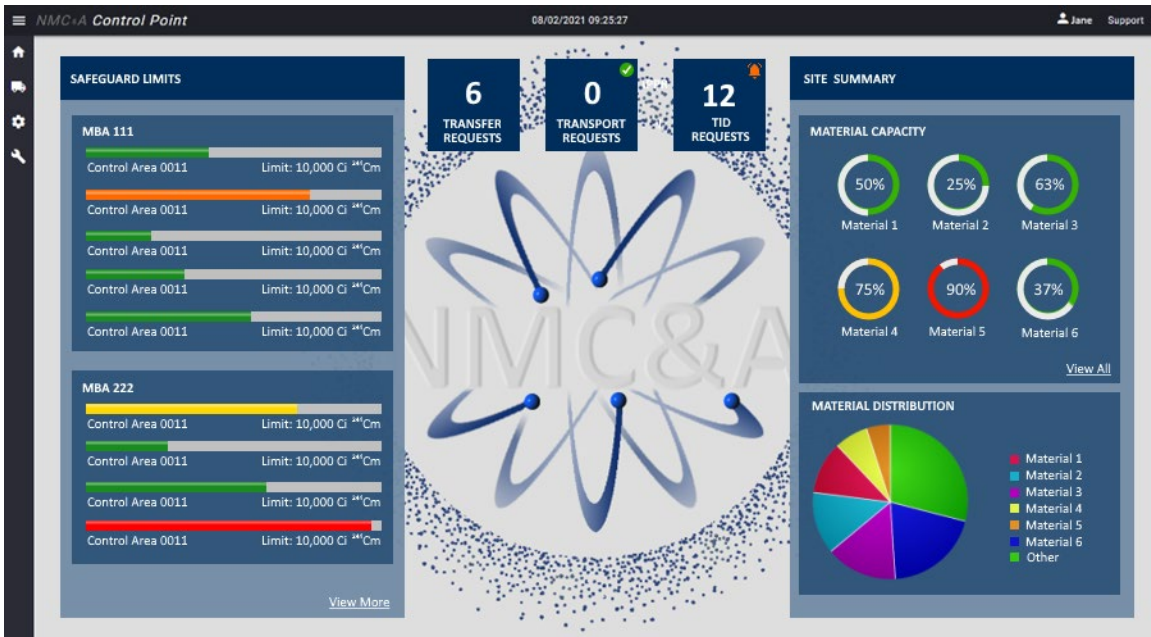


Figure 2: Landing page with potential tiles, charts, and indicators

The navigation pane on the left-hand side can be expanded to show features available in the application, as shown in Figure 3. From there, users can launch into creating, reviewing, or approving material transfer requests, or view existing and historical requests. A configuration menu provides options to allow users define Material Balance Areas (MBAs), authorize Material

Balance Areas Representatives (MBARs, referred to as custodians by some facilities), indicate the types of material to be tracked, define locations, and more. Common administrative functions are also provided, including the ability to identify users and their roles.

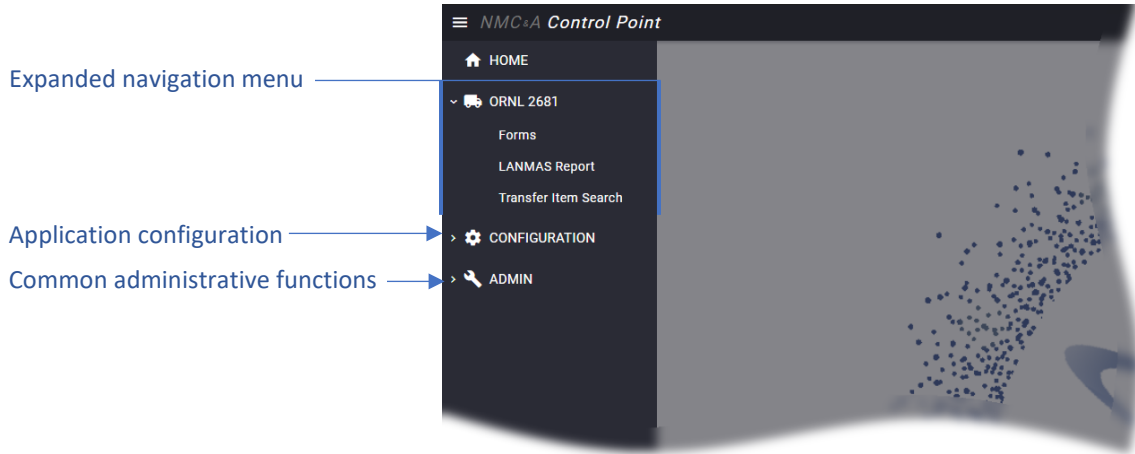


Figure 3: Expanded navigation menu

## REQUESTING A MATERIAL TRANSFER

To submit a request to transfer nuclear material via Control Point the requestor enters the same information as was captured on the ORNL-2681 paper form and the request is submitted for approval. Once the request has been submitted it must be approved, which is discussed in the next section of this document. The requester is notified immediately when the transfer has been approved. Figure 4 below shows how a user can request a nuclear material transfer, and Figure 5 portrays how to identify the items which are part of the transfer. Plans are underway to provide integration which will allow MBARs using software to manage their inventory to submit the 2681 information electronically via a Web API instead of having to hand-enter it.

NMC&A Control Point 09/22/2020 10:42:21 Jane Support

### Create ORNL Nuclear Materials Intra-Laboratory Transfer

Purpose \* Planned Date \* Transaction Number Status

From: MBA \* Control Area \* MBAR Approval/Date

To: MBA \* Control Area \* MBAR Approval/Date Transfer Completed by

NMC&A: NMCA Approval/Date

Tran. Type	Item Name	Number	Changed	C/P	Owner Code	Piece No.	Foreign Obligated
No records available.							

Attachments:  
 No attachments found

Figure 4: Creating a new transfer request.

### Create New Transfer Item

Transaction Type \* Item Name \*

Project Number \* Piece Number \* 0 Owner \* G - DOE Owned Material

Chemical/Physical Form \*

Gross Weight (lbs) \* Net Weight (lbs) \*

Material Types

Material Type	Element Weight	Isotope %	Isotope Weight

Figure 5: Identifying items to be included in the new transfer request.

## APPROVING A MATERIAL TRANSFER

Once a nuclear material transfer request has been submitted, a notification is sent to the responsible parties for review and approval. Approvers can review the information and approve or reject the request electronically, as shown in Figure 6. The requestor is notified immediately of the transfer approval or rejection via email.

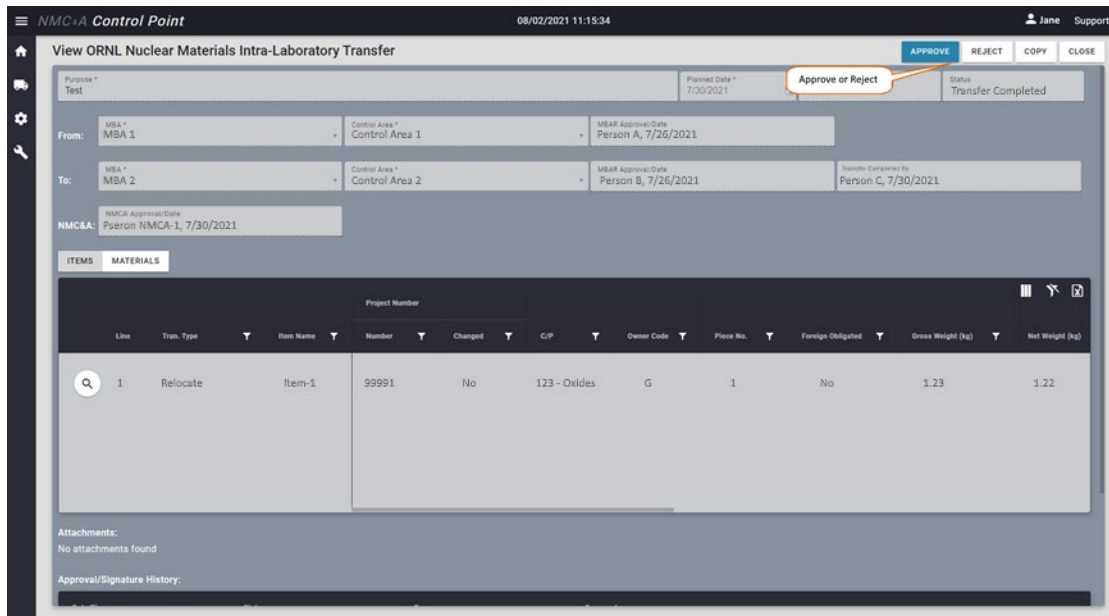


Figure 6: Approver can review request, then approve or reject it.

## ACCESSING CURRENT AND COMPLETED MATERIAL TRANSFERS

Locating transfer requests in Control Point is simplified via data grids offering access to all requests. The application also provides various ways to search and organize the data. Figures 7 and 8 below provide images of the grids and convey how users can:

- Group data. Data can be grouped by any column.
- Sort data. Sorting can be applied by clicking a column header.
- Filter data. One or more filters can be applied by opening the filter menu for any column and selecting to filter by exact matches, partial matches, and even complex joined matches, such as, filtering by a date range and within a specific areas or locations.
- Show/hide columns. Select which columns to display.
- Export data. Data can be exported to an Excel spreadsheet.
- See decimal precision. Users can toggle between the display of precise or rounded values.

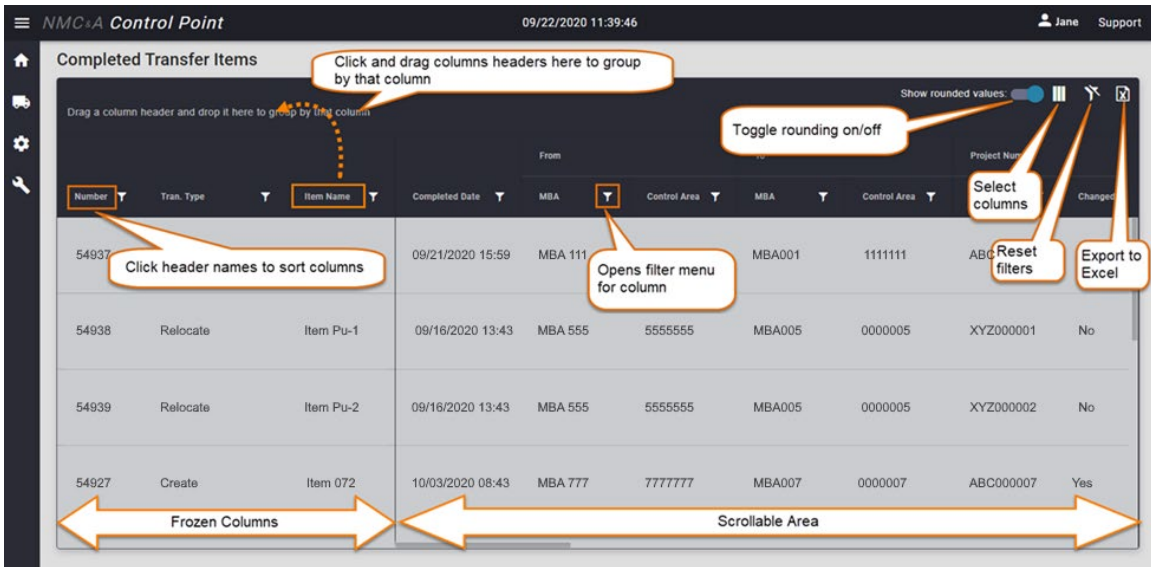


Figure 7: View existing and historical requests

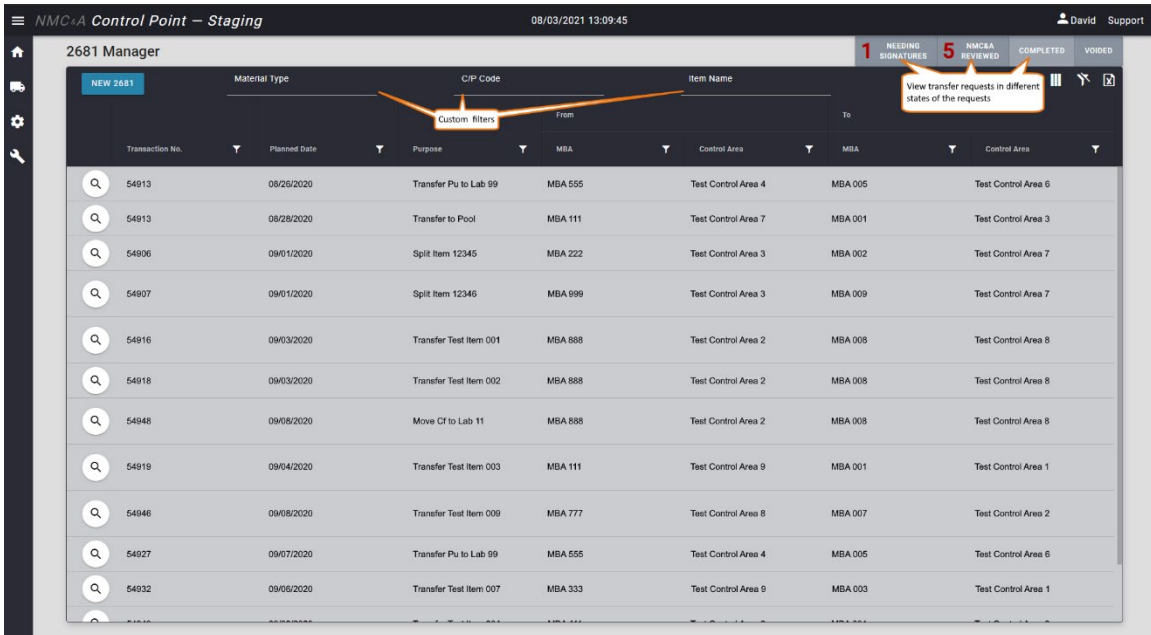


Figure 8: View current requests and their status

## TECHNOLOGY

Control Point was built adhering to a Model-View-Controller architectural pattern and primarily using a Microsoft stack. The data storage utilizes a Microsoft SQL Server database. As previously mentioned, plans are underway to provide a Web API to further lessen the amount of data entry required by MBARs.



## CONCLUSION

Control Point has succeeded in providing a more streamlined, sustainable, and efficient means of processing and tracking approvals for transferring nuclear material across the laboratory. Cost savings were immediately realized and feedback from users has been overwhelmingly positive. This effort has proven the validity and benefit of investing into converting our nuclear material accountancy business processes into a digital workflow and storage. Further development to digitize other NMC&A business processes is expected and will be integrated into the Control Point applications. Additionally, several individual MBAs at ORNL have recently produced software to aid in fulfilling the responsibilities of MBARs in nuclear material accountancy, resulting in more efficient, accurate, and thorough material tracking and processing. A long-term goal for the NMC&A Team and the Mission Application Group is to provide points of integration between these MBA applications and Control Point which would provide a reliable, single source of material accountancy for the entire laboratory.

## ACKNOWLEDGEMENTS

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We would also like to express appreciation to the United States Department of Energy (DOE) and the ORNL DOE Site Office for their review and approval of the project and their continued oversight and support of our efforts to improve our nuclear material accountancy.

We are grateful to the hard-working staff of the NMC&A Team, the Mission Applications Group, and the Systems Management Group for their efforts in implementing the application. It would also not have been possible without the feedback and support of the many MBARs at ORNL, especially Riley Hunley.

We would also like to acknowledge the Radiochemical Engineering Development Center at ORNL, who supported the implementation of an inventory material accountancy software application in partnership with the Mission Applications and the Systems Management Groups. This application will be the first to integrate workflows and data with the processes in the Control Point application.

Finally, we would like to express gratitude to Scott Stewart and Phil Gibbs for realizing potential future applications for Control Point and their guidance and assistance in creating this paper and its associated presentation.