

Courier Routing Study

Problem Statement

In 2015, OhioLINK member libraries completed a study that tracked how long print items took to be shipped from one library to another via OhioLINK's print courier system¹. At that time, items were tracked by having all delivery locations include a paper slip with the shipping date in outgoing bags; these slips were then collected and entered by receiving libraries with the date the shipments were received into an OhioLINK-maintained web form. This labor-intensive process ultimately collected data from about 88% of OhioLINK courier stops and determined the transit time to be 2.31 days.

Now, four years later, the Intercampus Services Policy Team would like to revisit and expand this transit time study. Two outcomes are desired with this second study: 1) to determine if the transit time between courier locations is still approximately the same as in 2015; and 2) to determine if the transit time can be significantly reduced by implementing an INN-Reach system feature that would allow libraries to preferentially fill requests to and from libraries within the same geographic courier hub.

Data Sources

The data used in this project are:

- INN-Reach Transaction Logs
- INN-Reach Title Reports
- PCIRC Bag Stats

Methodology

Transit Time Tracking

To measure the time that bags are in transit in the courier system, OhioLINK will evaluate the existing INN-Reach Transaction Logs. These are system-generated logs that contain time-stamped, numeric codes indicating when requested items pass through the various PCIRC phases, including when an item is put in transit by the owning library and when that item is taken out of transit by the requesting library. In particular, OhioLINK will focus on the following time ranges²:

- September through December 2015
- September through December 2016
- September through December 2017
- September through December 2019

For these time ranges, OhioLINK will consider the following system messages:

¹ Data was collected in this study for two weeks, from 10/12/2015 to 10/23/2015.

² Note that transaction data for September through December 2018 is not available and so this date range will not be used in any analysis.

- Item request (across servers) [100]
- Item information [200]
- Item put in transit (across servers) [201]
- Item checked in at borrowing library (across servers) [203]
- Item put in transit (same server) [701]
- Item taken out of transit (same server) [702]

The main calculation made will be the elapsed time between the 201 and 203 transit messages for regular INN-Reach requests in each time period. This will provide an average transit time for each year. It is expected that this average will be longer than was previously found in the 2015 study due to this transit time including processing time at both the owning and requesting libraries.

Note that in this study a few kinds of INN-Reach requests and circulations will not be included for a variety of reasons:

- Pickup Anywhere – these transactions are coded differently from regular PCIRC transactions and make up a small percentage of overall PCIRC
- Visiting Patron – these transactions do not include an item being delivered through the courier
- Requests & loans to SearchOhio libraries
- Most same server requests³ – these requests are typically requests from and filled by the same institution and may or may not use the courier

Improved Courier Routing

In addition to calculating the average transit time for September through December 2019, OhioLINK will also enable a new grouping feature in the central INN-Reach request balancing table. This feature will allow OhioLINK to group catalogs together so that requests from within a particular group are filled preferentially from available items within the same group. In cases where a request cannot be filled within a group, that request will (transparently to the patron) be filled by a holding library outside the defined group as usual.

This type of grouping, when matched to the existing courier hubs, is expected to increase the number of items being transferred within each regional hub and to decrease the number of items that are transferred between different hubs. Because same-hub deliveries are only sorted by the courier once at the regional hub and do not require further delivery to and sorting at the central Columbus hub, these deliveries are expected to take less time to deliver⁴, improving overall courier delivery time.

In order to determine the impact to delivery of filling requests within the same hub, two institutions in each hub will be placed into a newly-created group. Because of this grouping, each pair of libraries will

³ Same server requests for institutions in shared catalogs, such as OPAL or CONSORT will be included.

⁴ This assumption was borne out in the 2015 courier study; items that stayed within a regional hub arrived at their destinations more quickly than items that were delivered across hubs.

preferentially fill requests between themselves if available items exist. If an available item does not exist, the request will be filled from the larger OhioLINK community as usual.

The institutions that have agreed to participate in this project are:

- In Cincinnati: University of Cincinnati & Miami University
- In Cleveland: Kent State University & Case Western Reserve University
- In Dayton: Wright State University & University of Dayton
- In Toledo: Bowling Green State University & University of Toledo

Note that the Columbus delivery hub is not included for reasons detailed further on in this plan.

Study Process and Timeline

This overall study includes two pieces: 1) determining if the transit time between courier locations is still approximately the same as in 2015; and 2) determining if the transit time can be significantly reduced by implementing geographically-based requesting groups. Each piece of the study will follow a slightly different timeline.

First, in reviewing the transit time between courier locations, because this analysis will be conducted largely on data that has already been collected, most of this work is expected to be completed in October and November of 2019. Draft conclusions are anticipated to be available for the November ICS Policy Team meeting (excluding the 2019 data). Data for 2019 will be collected through the end of 2019, with final analysis and revisions to the draft report being completed by OhioLINK in January 2020.

More complicated will be the study process for testing geographically-based requesting groups. For this portion of the study, test library participation was confirmed in early July 2019. This project plan was written in July and August, and was revised and finalized by ICS in August.

To minimize impact on the INN-Reach system, implementation of the test groups will happen after the regular fall requesting rush at the start of the academic year. Additionally, implementation across the courier hubs will be staggered across a couple of months. Two geographic groups (Toledo/TOL and Dayton/DAY) will be implemented in September. This will allow both the participating libraries and OhioLINK to gather some initial data with minimal impact on the overall system.

Based on the experience gained in this initial implementation, in October the test libraries in two additional courier hubs (Cleveland/CLE and Cincinnati/CVG) will be put into separate requesting groups. This phase of the implementation could have a slight impact on the system due to the traffic in both the Cincinnati and Cleveland hubs, however this is still anticipated to be minimal.

In both of these implementation periods, OhioLINK will monitor all library fulfillments (at both test and non-test libraries), and if at any point there is a large change in lending volumes at either test or non-test libraries OhioLINK will mitigate these changes either through temporarily changing library PCIRC

priorities or by returning hubs to the regular requesting group as needed to bring overall system requesting back to normal levels.

It is worth noting that the above schedule does not include moving the Columbus courier hub into a requesting group. After a review of which libraries lend the most across the OhioLINK system, it was found that about 20% of all items loaned in the OhioLINK system come from either The Ohio State University or Ohio University - the two potential test libraries in the Columbus hub. Putting both of these institutions into a separate group from the rest of the PCIRC system would be expected to have large and immediate effects on non-test institutions. Because of this, ICS has determined that implementing a test group in Columbus will not be a part of this study.

Data will be collected from all implemented test groups through the end of December, at which point all test libraries will be returned to the single requesting group. OhioLINK will compile all data into a draft report that will be distributed to ICS for review ahead of the February 2020 meeting. Based on feedback from ICS, a final report including recommendations for any potential implementation of requesting groups will be compiled.

A streamlined schedule for the courier routing portion of the study is below.

Week Of	Description	Responsible Party	Notes
July 14	Initial project planning	OL	
July 21	Initial project planning	OL	
July 28	Initial project planning	OL	
August 4	Initial project planning, distribution of draft plan to ICS	OL	
August 11	Review of draft plan by ICS	OL, ICS	
August 18	Feedback, modifications, and final approval of project plan	OL, ICS, participating libraries	
August 25	Feedback, modifications, and final approval of project plan Notice to the PCIRC list of upcoming changes	OL, ICS, participating libraries	OL meets with Priority Dispatch on 8/26 and will discuss the project with PD at this time
September 1	Implementation of TOL and DAY test groups Notice to the PCIRC list of implemented changes	OL	
September 8	Monitoring of TOL and DAY test groups, impact on other libraries	OL	
September 15	Monitoring of TOL and DAY test groups, impact on other libraries	OL	
September 22	Monitoring of TOL and DAY test groups, impact on other libraries	OL	

September 29	Monitoring of TOL and DAY test groups, impact on other libraries Notice to PCIRC implementation team ahead of remaining library implementations	OL	
October 6	Implementation of CLE, CVG test groups Notice to the PCIRC list of implemented changes	OL	
October 13	Monitoring of all test groups, impact on other libraries	OL	
October 20	Monitoring of all test groups, impact on other libraries	OL	
October 27	Monitoring of all test groups, impact on other libraries	OL	
November 3	Monitoring of all test groups, impact on other libraries	OL	
November 10	Monitoring of all test groups, impact on other libraries; Project update at ICS meeting	OL	
November 17	Monitoring of all test groups, impact on other libraries	OL	
November 24	Monitoring of all test groups, impact on other libraries	OL	
December 1	Monitoring of all test groups, impact on other libraries	OL	
December 8	Monitoring of all test groups, impact on other libraries	OL	
December 15	Monitoring of all test groups, impact on other libraries	OL	
December 22	Monitoring of all test groups, impact on other libraries	OL	
December 29	Monitoring of all test groups, impact on other libraries	OL	
January	Return all libraries to a single group on 1/1/2020 Data analysis and draft report written for ICS	OL	
February	Report presented to ICS Policy Team; clarifications and revisions made	OL, ICS	

March	Final report presented to LAC along with any recommendations	ICS	
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Risks

While there are no risks associated with the first part of this proposed study (as the analysis will be done on statistics that the INN-Reach system collects automatically), there are a number of risks that go along with the second part of the study because it will cause patron requests to be routed differently.

Risk 1: Increased Demand on Some Items

Based on FY19 data, there are several libraries that heavily lend across the OhioLINK system. They are:

- Ohio State University (13% of items loaned - 40,368)
- Ohio University (7% of items loaned - 22,773)
- Wright State University (7% of items loaned - 21,087)
- Kent State University (7% of items loaned - 20,682)

It is notable that the top two lenders are the two potential test partners for the Columbus hub, and that loans from these two libraries make up about one-fifth of overall annual PCIRC for OhioLINK. It is possible that should Ohio State University and Ohio University no longer in the same group as the majority of the other OhioLINK institutions that the system will shift to filling this large percentage of items from other OhioLINK locations. This shift could cause an unexpectedly and unmanageably high request volume at libraries not explicitly participating in this test.

Mitigation: OhioLINK will monitor PCIRC request balancing on a bi-weekly basis to make sure that no one library sees a dramatic increase in items requested. If there is a large increase of requests found at an institution, OhioLINK will adjust the lending priority at that institution downward. If there is a large increase of requests at many institutions, one or more hubs will be removed from the test.

Additionally, the Columbus hub will not be implemented as a test group.

Risk 2: Adverse Effect on Test Library Branches in Different Courier Hub

Groups can only be assigned at the INN-Reach agency/institution level (at the level of 5-character codes). In geographically spread out institutions, however, not all branch courier stops are located in the same regional hubs. In these cases the system will consider all branches to be in the same group that the agency or institution is assigned. Practically speaking, this means that all requests from branches located in hubs separate from their main library's will preferentially have requests filled from libraries in the main library's hub. It is possible that this could slightly increase transit times to these branch locations if more requested items are forced to travel across courier hubs. However, given that the Central Catalog currently fills requests randomly from all available copies of a title, it is also possible that many items are currently being filled across hubs and that organizing libraries into groups will have little effect on overall delivery times.

In the test libraries the following stops are located in different hubs than the main library:

- Bowling Green State University (TOL)
 - Bowling Green State University – Firelands (CLE)
- Case Western Reserve University (CLE)
 - None
- Kent State University (CLE)
 - None
- Miami University (CVG)
 - Miami University – Middletown (DAY)
- University of Cincinnati (CVG)
 - None
- University of Dayton (DAY)
 - None
- University of Toledo (TOL)
 - None
- Wright State University (DAY)
 - None

Mitigation: Because this is driven by the system, there is no mitigation possible. However, it will be possible to track what impact (if any) the hub grouping has on delivery times to these branch locations.

Risk 3: Courier Challenges due to Increased Traffic between Test Institutions

Because each pair of libraries in this test is anticipated to see increased lending between themselves, it is possible that there will be an increased load on these specific courier routes.

Mitigation: OhioLINK will notify Priority Dispatch about which libraries will be participating in the test ahead of time. Priority will then be able to let OhioLINK know if there are any routing issues. Should this happen, the affected libraries can be placed back into the larger OhioLINK group depending on the severity of the issue.

Risk 4: Courier Delays from Increased Same-Hub Traffic

It is expected that during the test period fewer OhioLINK items will need to be taken to the Columbus hub for cross-hub sorting and delivery. It is possible that this will affect the load that Priority Dispatch must account for in the overnight transportation between Columbus and the other regional hubs.

Mitigation: As in the mitigation for the previous risk, OhioLINK will notify Priority Dispatch about which libraries will be participating in the test ahead of time. Priority will then be able to let OhioLINK know if there are any routing issues. Additionally, the limited number of participating test institutions combined with the fact that OhioLINK stops make up just over one-third of the total number of courier stops in the system should make any impact negligible.

Results

This section will be completed following the two different portions of this study. However, results are expected to include:

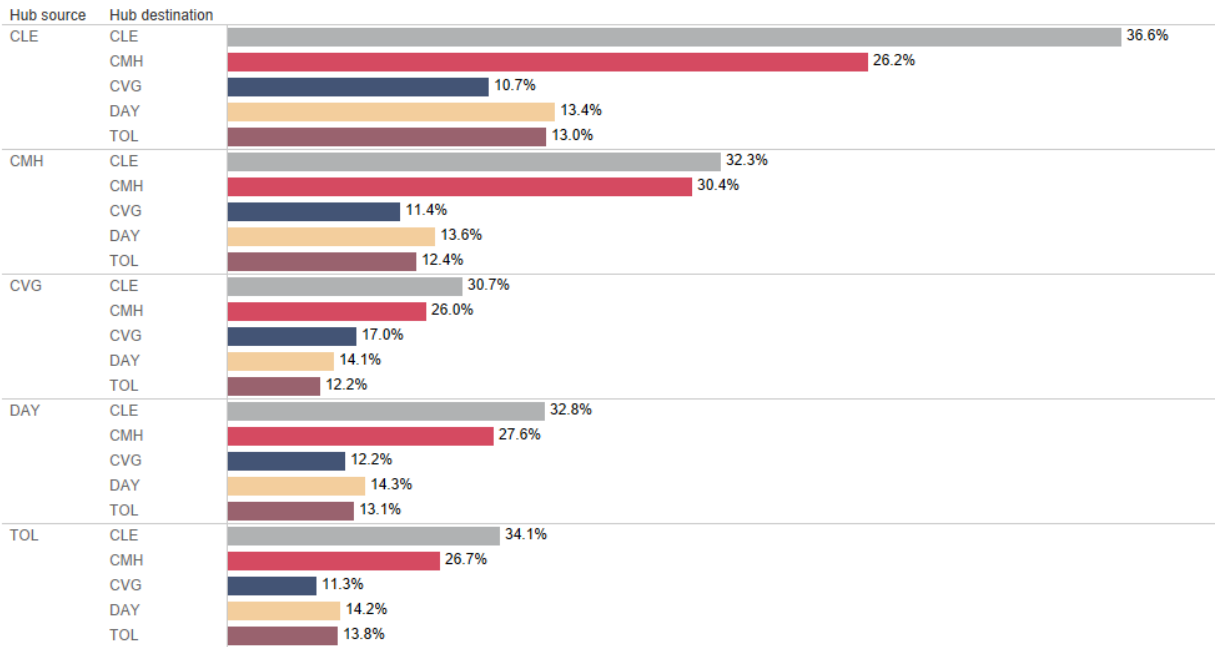
- Transit time averages overall and by delivery hub for 2015, 2016, 2017, 2019
- Transit time averages between Bowling Green State University & University of Toledo, Case Western Reserve University & Kent State University, Miami University & University of Cincinnati, and University of Dayton & Wright State University for 2015, 2016, 2017, 2019
- Comparison of grouped and non-grouped libraries' delivery time during the study

Conclusions

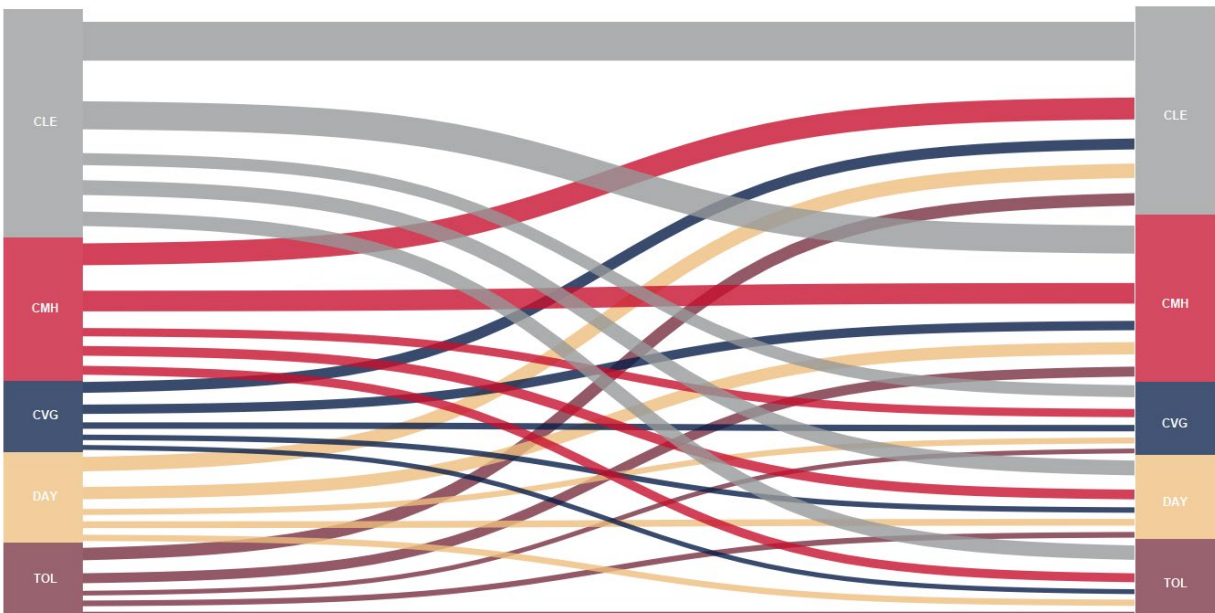
This section will be completed after the conclusion of the courier test. Final conclusions are expected to include one of the following: recommendation to have all libraries remain in a single request group; recommendation to expand regional request groups to the entire system; or a determination that results of the study are inconclusive and additional data is needed to make a recommendation.

Appendix 1 – Number of Bags Delivered to Geographic Hubs, FY2019

FY19 bags delivered across hubs (excluding SearchOhio)



FY19 bags delivered hub to hub



Appendix 2 – Number of Fulfillments across Geographic Hubs, FY2019

FY19 fulfillments across hubs Sept-Dec 2018 (excludes SearchOhio)

