



The Impact of the URcast™ System in the Classroom

January 2014

<http://www.URcastNetwork.com>

This White Paper is for informational purposes only. URCAST NETWORK MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS DOCUMENT.

Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of URcast Network.

URcast Network may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from URcast Network, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

© 2014 URcast Network. All rights reserved.

The URcast System

URcast is a software product that runs on servers installed in a school and on student and teacher devices such as PCs, iPads and Android devices. URcast stores content selected by teachers – such as large video files – and delivers it automatically to student devices using the school's Local Area Network. URcast eliminates the need for each student to download their own copy of the files across the school's external Internet connection. By doing this, URcast significantly reduces usage of the expensive external connection. Teachers control what content is delivered to the students as well as the time and date the content is sent, exists and expires on the student devices, thus enabling smarter and more efficient use of valuable network resources. URcast is a Content Delivery System (CDS) for educational resources.

100x Savings In Internet Usage

East Lee Middle School in Lee County North Carolina has 750 students and 30 classrooms. URcast was deployed in 8 classrooms over the period January 6 to February 6, 2014. During that period, 8 teachers and 250 students used the system to access educational content. All content transfers were measured and the measurements were logged by the system. The following analysis extrapolates from measurements of the 8 classrooms where the system was used, estimating total consumption and savings if URcast had been deployed to all 30 classrooms.

	Millions of bytes per month	Change
Data consumed per student	1,314	
Usage of external Internet connection (whole school)	No URcast: 985,699 With URcast: 1,613	99.8% reduction (>100x)
Usage of in-school Local Area Network	No URcast: 985,699 With URcast: 1,084,269	10% increase (URcast overhead)

A small increase in usage of the in-school Local Area Network occurred due to the overhead of operating the URcast system. This increase had no cost impact for the school since LAN capacity was not a bottleneck. In exchange, the system significantly reduced usage of the expensive external Internet connection. Usage was reduced because content was downloaded one time from the external Internet by a teacher, then distributed within the school to students and to other teachers that wanted to reuse the content.

In many cases, deployment of a Content Distribution System will be more cost effective than increasing raw Internet access bandwidth to support the same level of student access to educational content.

Less Wasted Classroom Time

FCC Chairman Wheeler made this observation: "*I was recently at one middle school where the students told about how the network would crash if too many of them pushed 'Enter' simultaneously,*" Wheeler recalled.

A Content Distribution System like URcast optimizes valuable class time. The content selected by the teacher is distributed in advance and shows up automatically on the student's device at a time chosen by the teacher. The student doesn't have to access the Internet – they simply double click the icon for a file that is already on their device. By doing this, content distribution dramatically reduces wasted time due to Internet access delays and errors. Since time in the classroom is one

of the most valuable educational resources, the improved user experience is a significant benefit of deploying a Content Distribution System.

Lee County Schools conducted an experiment to assess the user experience benefits of URcast. An LCS Instructional Technology Facilitator carried out the experiment on February 6, 2014 at East Lee Middle School (ELM).

ELM has a 1 Gigabit/second external Internet connection. The classroom used for the experiment has a single Wi-Fi Access Point (802.11g/n). 15 ELM students participated and were asked to access Discovery Education's "Junior Space Scientist Riding in the Sky" video. The video is 8 minutes and 36 seconds long; the file is 15.7 megabytes. To prepare for the test, the Facilitator used URcast to schedule the video to be delivered to the student devices 10 minutes before the start of class. The results of the test are summarized in the following table.

	Instruction to Students	Outcome
Traditional Internet	To all 15 students: Open Web browser Locate video within discovery education Select the play button	6 students: Video began within 30 seconds 9 students: Received an error message
	For the 9 students who got an error: Download video Select the play button	7 students: Download completed after 1.5-2.5 minutes 2 students: Gave up after waiting 15 minutes
URcast	To all 15 students: Open URcast Student Message Center Double click on Science Class Click on the video	15 students: Video began after 5.2-8 seconds

The Instructional Technology Facilitator noted that the first two rows of this table are a typical experience. Each and every class has a similar error rate when using traditional Internet access methods to retrieve educational content. Teachers cannot use multimedia content as much as they would like because of the time it takes to deal with errors and wait for downloads. The fast response of a content distribution system like URcast removes these barriers to employing multimedia content and maximizes the amount of classroom time available for learning.

Learning For All Students

Content distribution systems like URcast assist in providing the best possible education to all students in a school. If appropriately specialized for school use in the way that URcast is:

- A CDS can deliver different content to different students for the same lesson, automatically, enabling teachers to personalize learning.
- Since the content resides on the device and is downloaded while the student is at school, all students have the same user experience for homework regardless of their home Internet connectivity.
- The teacher controls what data is delivered and when it expires. The students do not need to be on the Internet during in-school or at-home study time, reducing wasted time and inappropriate content access.

These benefits are not theoretical. The URcast system has the above features and shows that content distribution is practical for schools today. Experience in Lee County Schools North Carolina validates the technical and user benefits of this technology.

Appendix: Details Of Usage In One Math Classroom

The table below reports the content distributed using URcast between January 8 and February 6, 2014 by a 6th Grade Math Teacher at East Lee Middle School in Lee County North Carolina. The rightmost column labeled "Teacher Content MB" is the total number of megabytes of content stored by the teacher in the URcast system for that lesson.

With a traditional Internet access method, the total megabytes that would be transferred across the school's expensive external Internet connection is multiplied by the 25 students in the class, resulting in 6271 MB used in one month for this class. With a Content Distribution System like URcast, the total megabytes used on the external Internet connection was just 251 MB.

SINGLE MATH TEACHER BANDWIDTH USAGE East Lee Middle School, NC School Days between January 8 to February 6, 2014		
Math Lesson Description	File Type	Size MB
ADDING DECIMALS	MP4	10
WEEK 17 VOCABULARY	MP4	22
SUBTRACTING DECIMALS	MP4	8
DECIMALS VERSATILES	PDF	0.72
MULTIPLYING DECIMALS	MP4	9
DIVIDING DECIMALS	MP4	30
WEEK 18 VOCABULARY	MP4	35
WEEK 19 VOCABULARY	MP4	16
EXPONENTS	MP4	27
EXPONENT PRACTICE	PDF	0.1
ORDER OF OPERATIONS	MP4	24
ORDER OF OPERATIONS VERSATILES	PDF	0.46
DECIMAL AND EXPONENTS PRACTICE TEST	DOC	0.19
DECIMAL AND EXPONENTS PRACTICE TEST ANSWERS	PDF	0.36
COMMUTATIVE PROPERTIES	MP4	10
IDENTITY PROPERTIES	MP4	11
WEEK 21 VOCABULARY	MP4	18
ASSOCIATIVE PROPERTIES	MP4	16
DISTRIBUTIVE PROPERTY	MP4	13
Teacher WAN TOTAL (January 8 to February 6, 2014)		250.83

Total Student Consumption (of one class 25 students) = 6270.75 MB
Total WAN Used (teacher download only)= 250.83 MB