Strategic Modernization with PHP on IBM i

SEIDEN GROUP

www.SeidenGroup.com

Seiden Group and Club Seiden

Alan is a leader and expert in PHP on IBM i; leader, Zend's PHP Toolkit for IBM i: and "Performance guru of PHP on IBM i"

SEIDEN GROUP

Seiden Group is a team of experts available for mentoring/troubleshooting/project advice/development.

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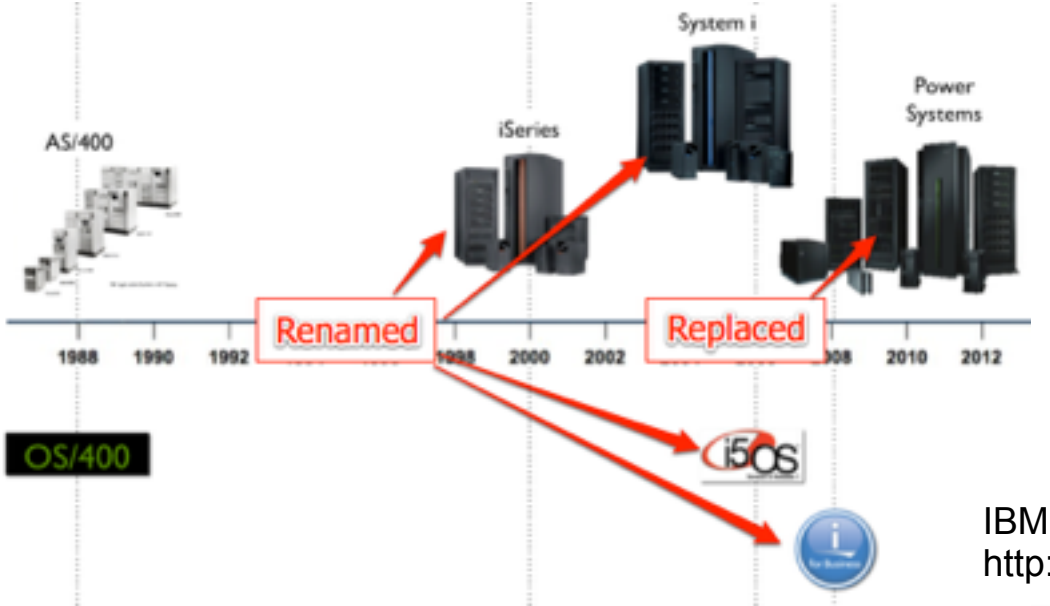
Why I like IBM i

DB2 database at its heart

- **DB2 built in**
  - Transaction processing workhorse
  - Database implemented below operating system level!
    - IBM i's "Machine Interface (MI)" between OS and hardware
  - Journaling, auditing, commitment control very commonly used
  - Never corrupted
    - Doesn't lose data even if knock out power plug
- **Database often taken for granted**
  - Self-managing such that DBAs are rare
- **MySQL also supported (Zend DBi)**
  - Can connect to DB2 via "DB2 Storage Engine"

Data and programs last forever

- **IBM has been dedicated to legacy app longevity and data longevity**
  - RPG (and occasionally COBOL) running for 30-40 years
  - DB2 data evolving 30-40 years
  - Middleware insulates applications from hardware changes



IBM i Heritage chart from Trevor Perry
http://blog.angustheitchap.com/?p=415

Long-serving back ends, new front ends

- **What does this mean to you?**
  - RPG and DB2, mature and evolving for years, can be part of your data model, accessed by PHP
  - Create web GUI interfaces and web services around these venerable resources
    - Business logic is encapsulated in RPG/COBOL/DB2
    - You can keep your hands somewhat clean of business details
  - Case studies later in this presentation

Nondisruptive business growth

- **Scales vertically**
  - One system can handle large and diverse workloads
    - Total Cost of Ownership (TCO), including reduced operator costs, is said to be competitive or cheaper than assembling server farms
  - Can activate additional processors without restarting system

- **Dependable**
  - Resistant to viruses
    - Object-based system since the 1970s
  - Journaling, commitment control, replication, high availability
  - Security features galore
  - Keeps on running
    - You will sleep soundly at night

Steve Pitcher @stevencpitcher 2 Jun

#IBMi is impervious to viruses, malware, hackers, mother-in-laws and the zombie apocalypse. #powersystems

Why I like PHP

PHP runs on IBM i, runs everywhere

- **Available for IBM i, Windows, Linux, Mac…**
  - Open source, widely used, millions of sites
  - Facebook, Wikipedia, too many to name
- **Runs simply on IBM i**
- **Direct access to DB2 and RPG**
  - Accesss LIVE DATA, which we value on IBM i

Easy to start small

- My first professional PHP code was one line to send an email message
- No need to know everything. Start gradually and learn
- PHP is mainstream. Information on php.net and elsewhere
- A track record of over 20 years of community +corporate collaboration

Integration with IBM i

- **PHP Toolkit**
  - Call RPG, COBOL, CL
  - Access data queues, data areas, etc
- **DB2 and SQL**
  - ibm_db2 included on IBM i
  - PDO_IBM may soon be another option
- **Zend Framework 2 support of IBM i DB2**
  - For larger applications
  - Simulation of LIMIT/OFFSET for easy pagination
    - (Db2 has now added real LIMIT/OFFSET, though)

Support for APIs and web services

- **Web service capabilities in PHP**
  - Native SOAP functionality
  - for REST: json_encode(), json_decode()
  - cURL (http and more…talk to the internet) now a native, included extension

- **APIs**
  - Using Apigility, PHP can serve “correct” REST APIs, handling errors, versioning, links

Zend/IBM's commitment from 2005-6

MC|PRESS online

Zend Brings PHP to IBM's i5/OS

Programming - Web Languages

Written by Alan Seiden

Tuesday, 11 July 2006 18:00

PHP, the popular cross-platform Web development tool, shows great versatility. It offers power to the pro and simplicity to the novice. It runs on many hardware and software platforms, including Windows, Mac, UNIX, and System i. PHP offers other benefits as well:

- Requires no licensing fees
- Runs many blogs and content management systems
- Can connect disparate systems with technologies such as SOAP
- Is endorsed by IBM

from 2006: "[Andi] Gutmans says Zend intends to port all its products to System i, treating the platform's users as first-class citizens."

http://mcpressonline.com/programming/web-languages/zend-brings-php-to-ibms-i5os.html

PHP: Open + Enterprise

- **Community-driven open source**
- **Enterprise-ready capabilities from Zend**
  - Professional support with SLA (Rod/Shlomo)
  - Tools in Zend Server
    - Monitor
    - Code Trace
    - Z-Ray
    - Job Queue
    - Deployment
    - Remote debugger
  - Zend Studio IDE integrated with Studio
  - Developer and production “black box” tools

IBM + Zend

- **IBM i systems ship with Zend Server (PHP)**
- **PHP on IBM i packaged and supported by Zend**

IBM booth, ZendCon 2010

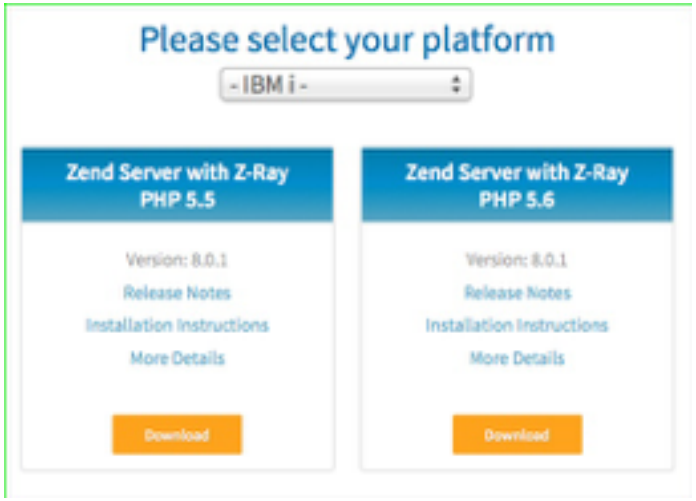
IBM's Tony Cairns and Alan S.
working on new toolkit, ZendCon 2011

Community

Getting started

Zend Server for IBM i

- **Download Zend Server 8.x**
  - http://www.zend.com/en/products/server/downloads-ibmi
    - Easy upgrade from 6.x and 7.x



- **Editions**
  - http://www.zend.com/en/products/server/editions
  - Basic (free), Professional, Enterprise
  - Same download, different license

Flow-ruining technical topic

CCSID

Modernize IBM i with CCSID

- **CCSID (coded character set identifier) for conversion of EBCDIC<—>ASCII, Unicode, etc.**
  - Required when using non-native languages such as PHP or communicating with the outside world
  - An essential component of modernization

- **DSPSYSVAL QCCSID**
  - Anything other than 65535 is OK
  - Change with CHGSYSVAL SYSVAL(QCCSID) VALUE(n)

- **or in Apache config: /www/zendsvr(6)/conf/httpd.conf**
    - DefaultFsCCSID 278
      CGIJobCCSID 278
  - For your CCSID, check the list of “Job CCSID”:
    - http://www-03.ibm.com/systems/i/software/globalization/default_list.html

PHP basics: Step 1

- Learn some basic HTML
  - Try http://w3schools.com/html
  - Tables (<table>,<tr>,<td>) useful for business data
  - "View Source" in browser to borrow bits of HTML
- Then learn these as you go
  - Javascript
    - Adds dynamic functionality to pages
  - Cascading style sheets (CSS)
    - Modern way to specify colors, fonts, style
    - Later…try Bootstrap CSS (getbootstrap.com)

Step 2: Try a simple PHP script

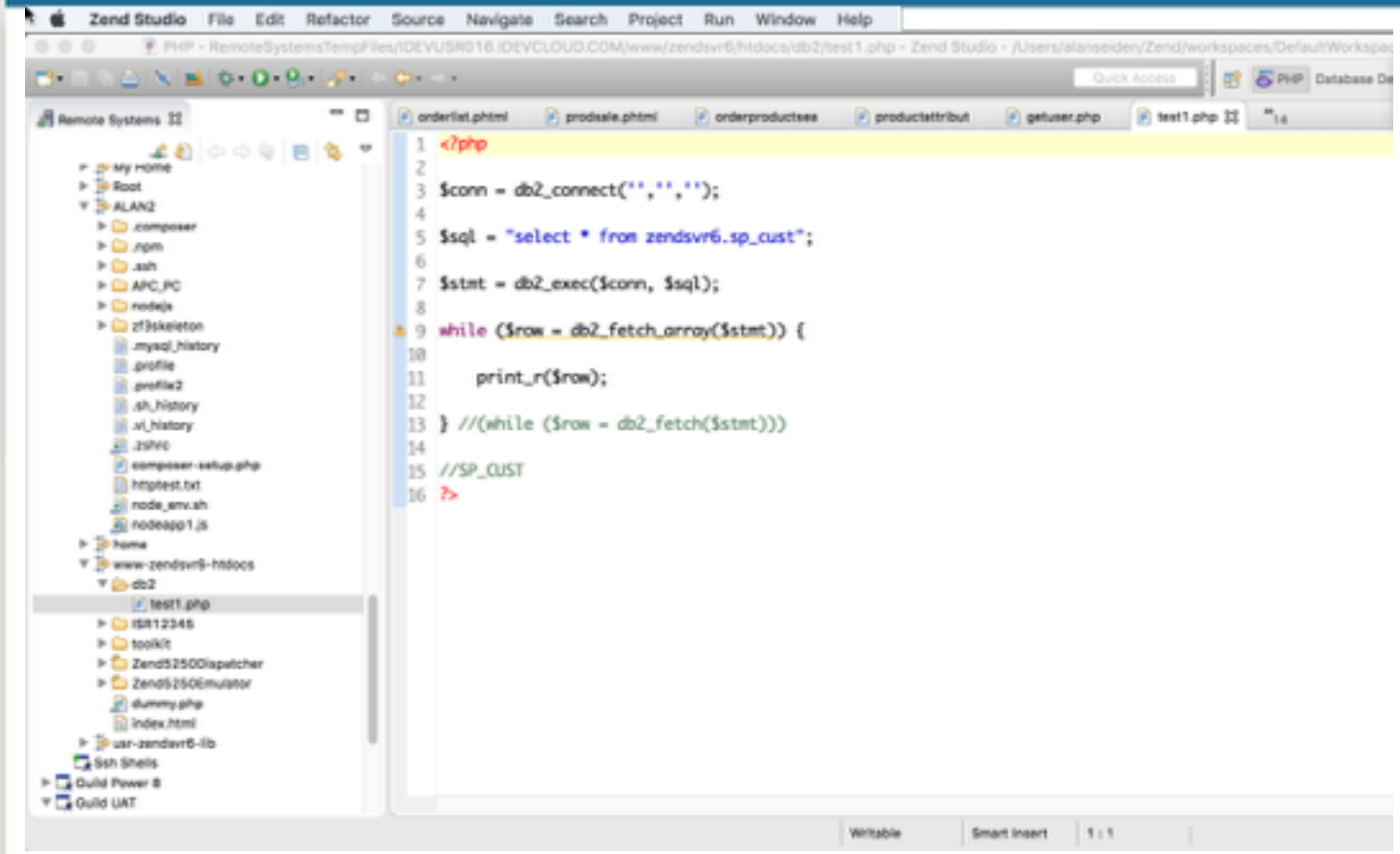
- PHP scripts are text files that reside in the IFS
  - Edit using notepad or Zend Studio
- Example: /www/zendsvr6/htdocs/helloworld.php
  - Run in browser: http://yourIBMi:10080/helloworld.php

```
<?php

    // simple script to test PHP
    echo "Hello, world!";

?>
```

Zend Studio IDE free download for IBM i



http://www.zend.com/en/products/studio/downloads
Choose Mac OS, Windows, or Linux version

Step 3: Access db2

- See Zend Server sample application
  - Connect to db2 on i
  - Select records from a db2 table
  - Output the records into an HTML table

Executing SQL statement: SELECT * FROM ZENDSVR.SP_CUST WHERE CUST_ID > 1220 FOR FETCH ONLY

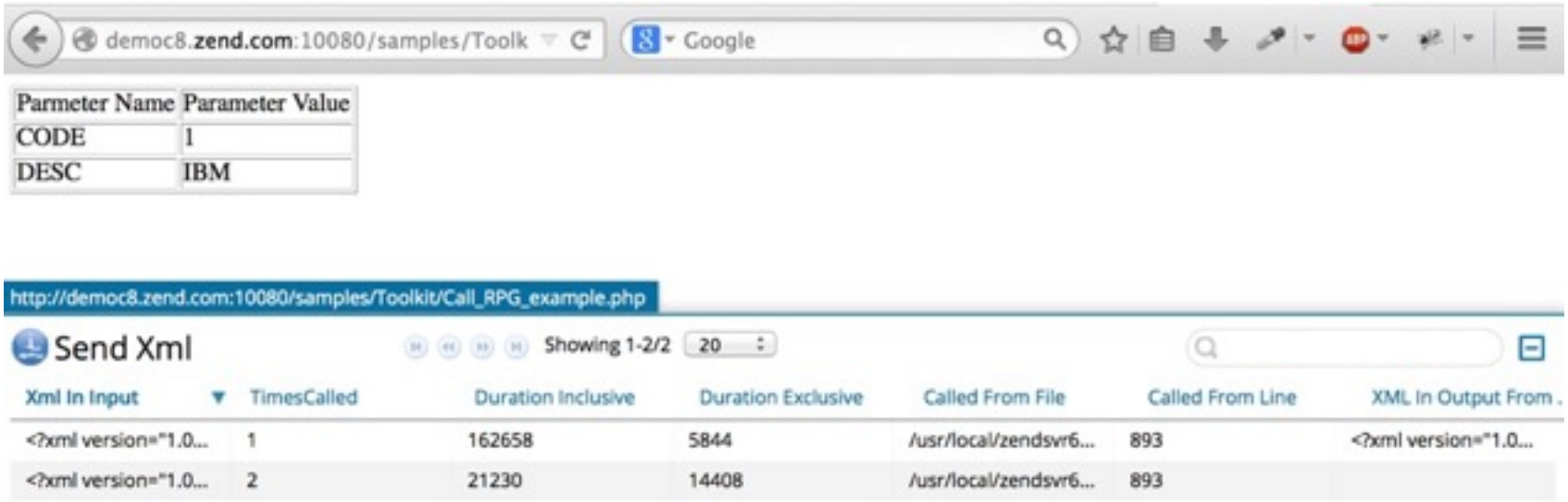
CUST_ID	COMPANY	FIRSTNAME	LASTNAME	CIVIL	ADDRESS	ADDR2	CITY	STATE	ZIP
1221	Kauai Dive Shoppe	LINA	Norman	2	4-976 Sugarloaf Hwy	Suite 103	Kapaa Kauai	HI	94766-1234
1231	Unisco	George	Weathers	1	PO Box Z-547		Freeport		
1351	Sight Diver	Phyllis	Spooner	1	1 Neptune Lane		Kato Paphos		
1354	Cayman Divers World Unlimited	Joe	Bailey	1	PO Box 541		Grand Cayman		
1356	Tom Sawyer Diving Centre	Chris	Thomas	1	632-1 Third Frydenhoj		Christiansted	St. Croix	00820

What else happens when PHP is used?

- Spurs modernized database
- More modular RPG
- New demographics in IT
- IT can “own” innovation again
- Business owners get a taste of what can be done

Z-Ray, to speed development

- **Shows every query and time for each**
- **Toolkit extension for Z-Ray shows each program call, input/output, timing**
  - Save time otherwise spent hunting in debug logs!



Who can program PHP?

- RPG developers who know SQL or can learn it, especially if they've used other languages, too.
  - (RPG Free is similar to PHP and most modern languages, though!)
  - Don't expect great UI, but often nice internal apps
- Outside or new PHP developers
  - Often have broader view of user interface, but still need to collaborate with RPG/DB2/IBM i person who understands the data. The combination can work well.

Open source applications

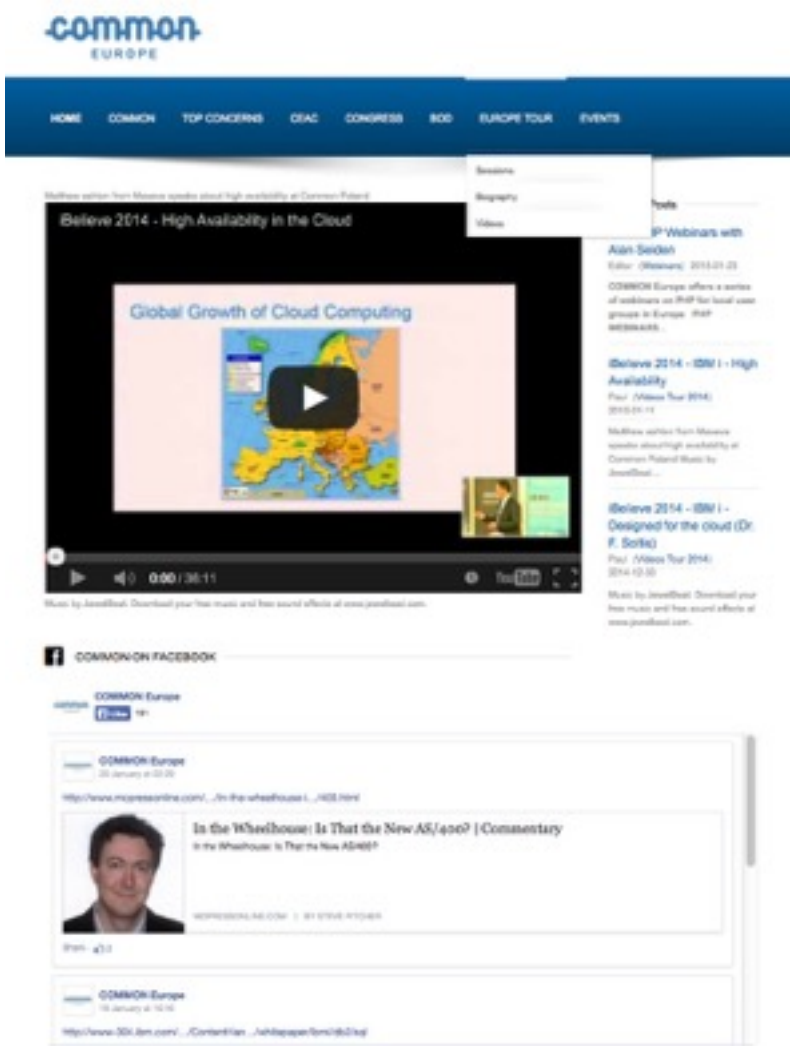
Quick return on investment: open source

- Install open source applications; change the perception of your IBM i
- Your IBM i will instantly seem “modern.”

- PHP-based content-management systems an easy place to start
  - Joomla, Drupal
  - Wordpress
  - Mediawiki

- They use MySQL database (included with Zend Server)
  - Can be linked to DB2 using DB2 Storage Engine

COMMON Europe: Joomla

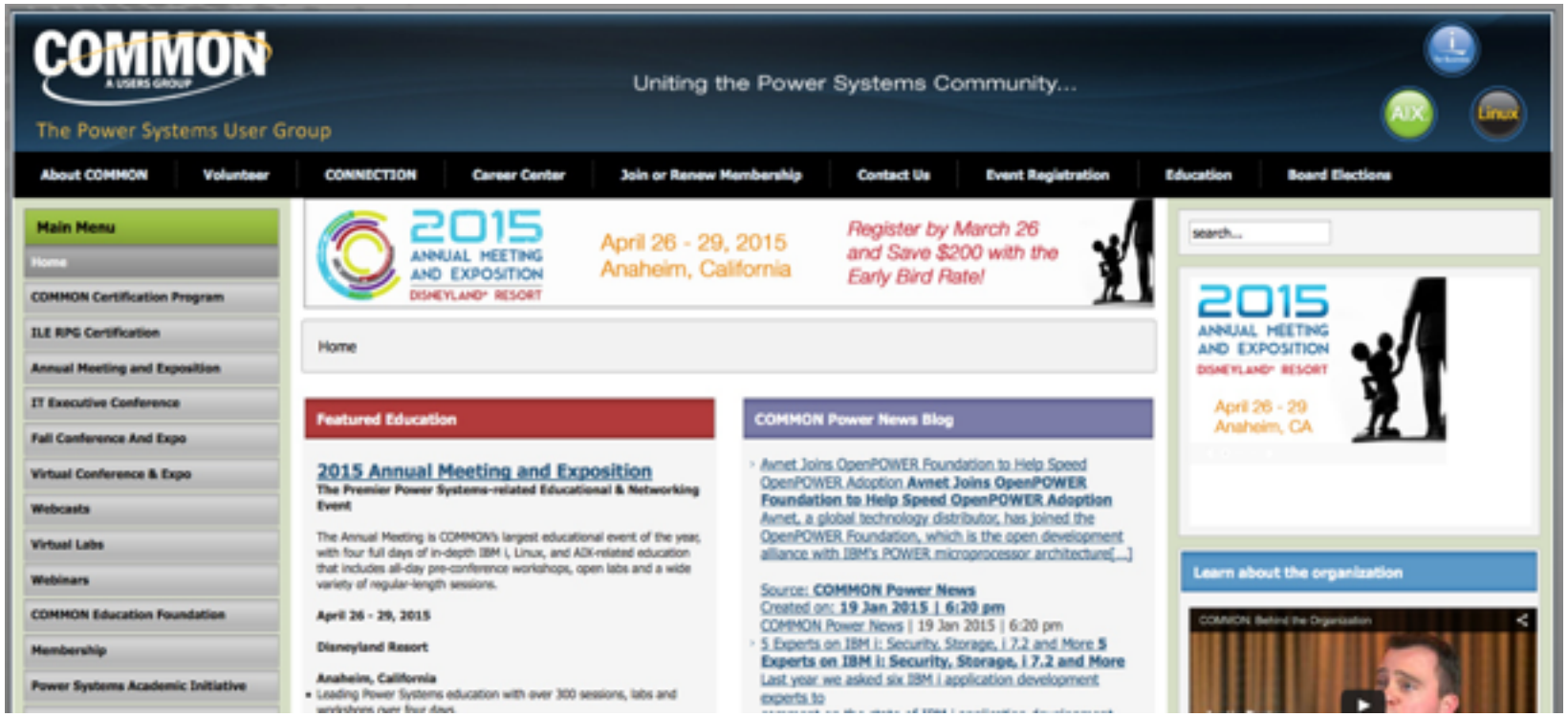


- Videos
- News
- Social media widgets

Data3: Wordpress

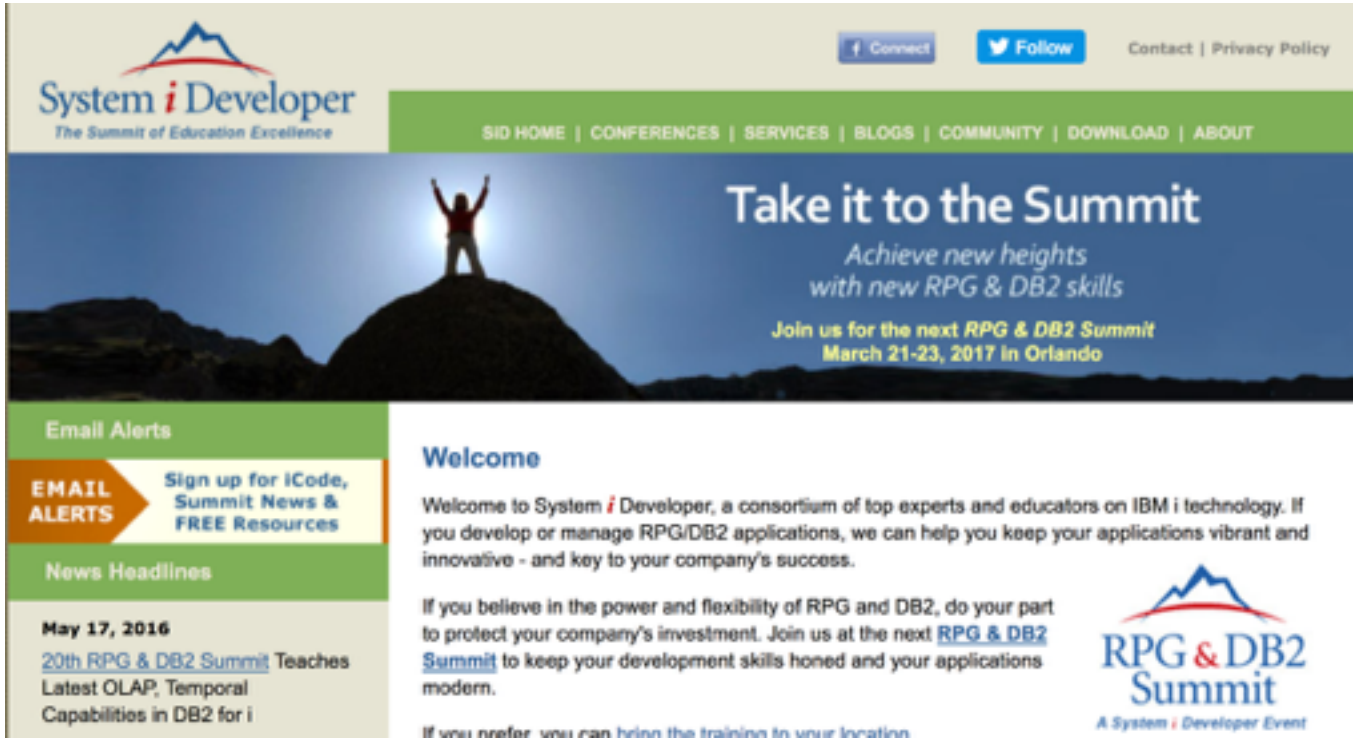
- News-style theme
- Themes are easy to download
  - Some free, some not
- Excellent at blogs
  but also good at general
  content management

COMMON.org: Wordpress on IBM i



- **Zend Server on IBM i**
- **Manages a great deal of information and media**

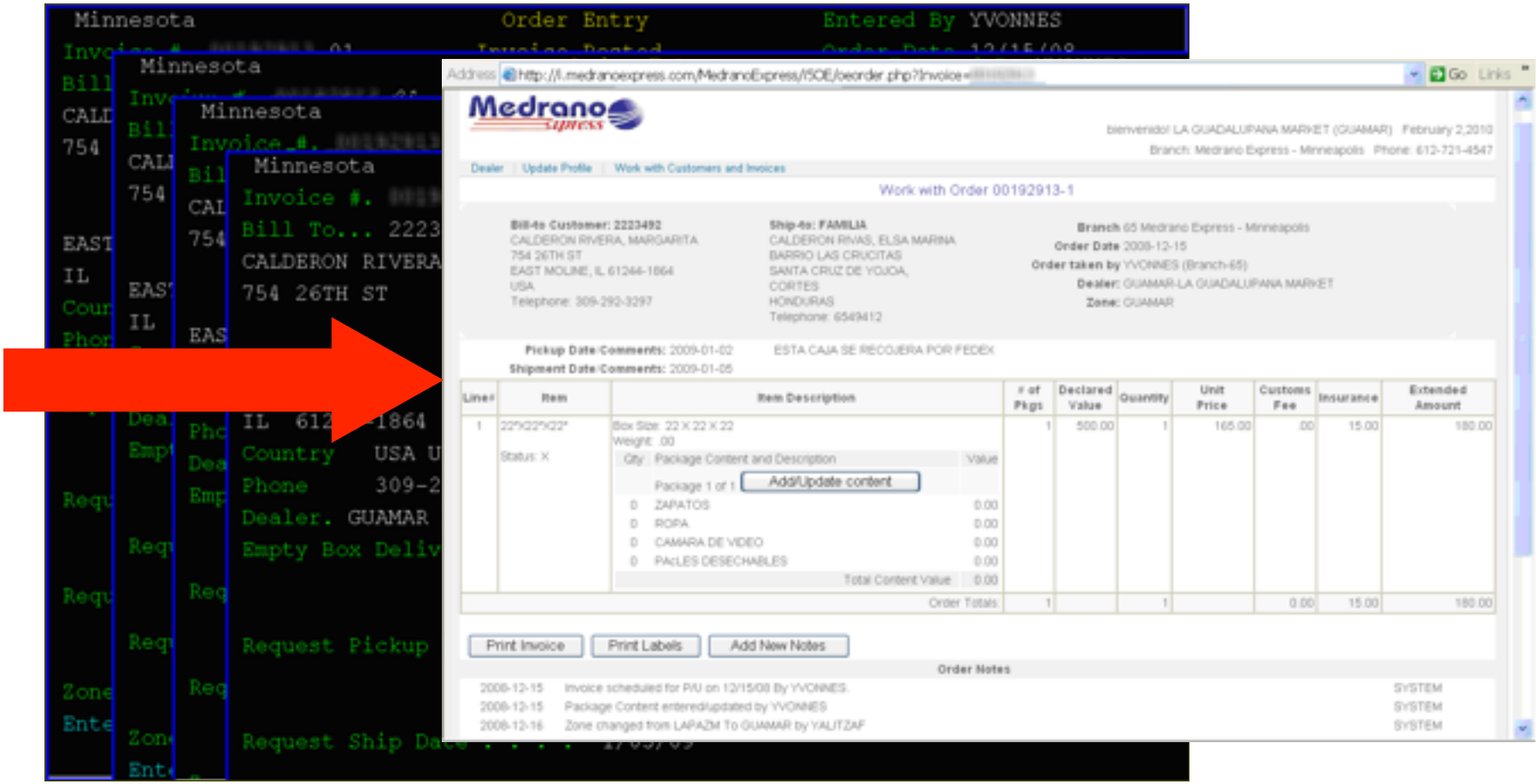
System i Developer: Wordpress on IBM i



- **Zend Server on IBM i**
- **Also custom PHP to manage conference reservations, sponsorships, more.**

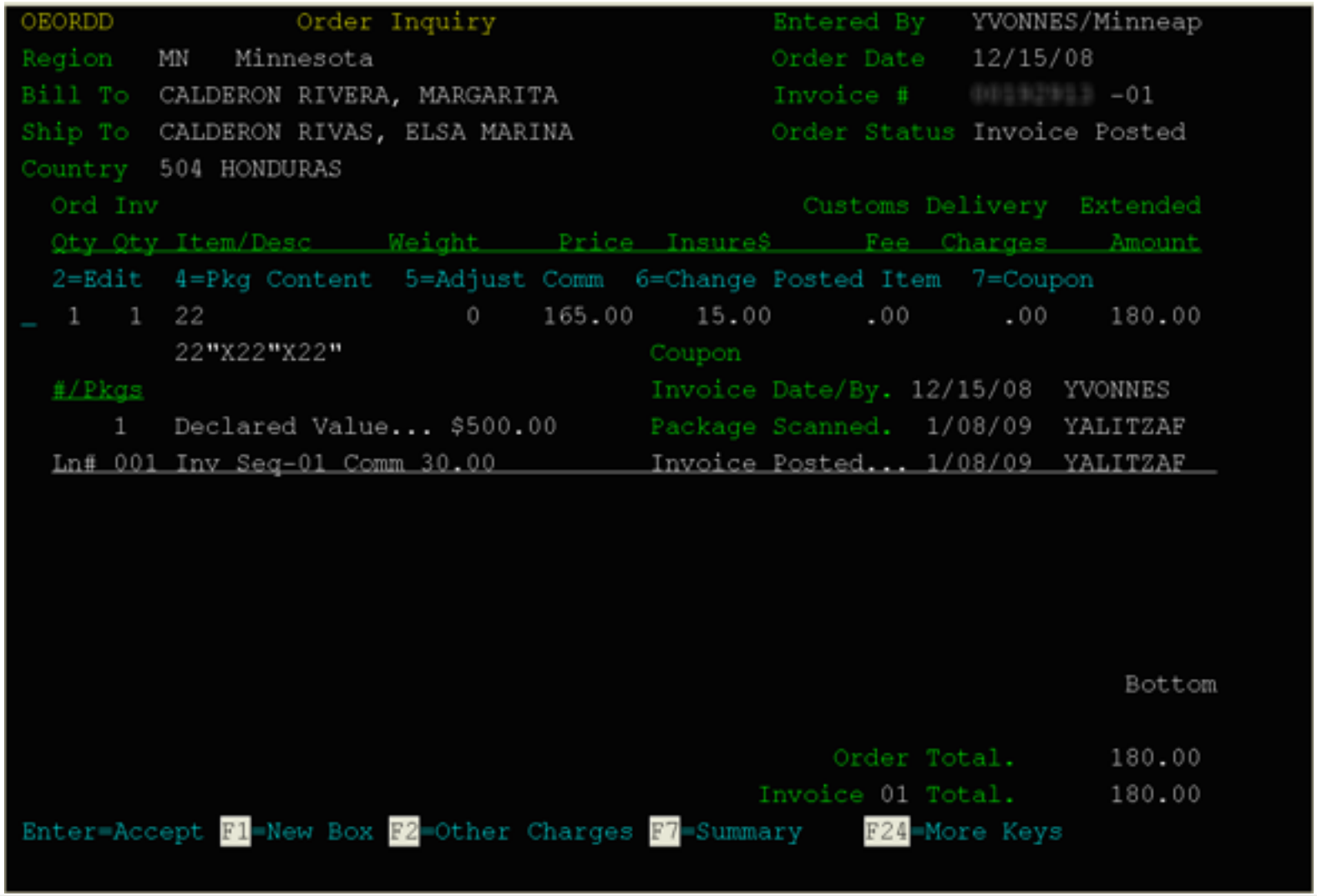
Extend green screens to the web

Call RPG/COBOL: adapt 5250 logic to the web



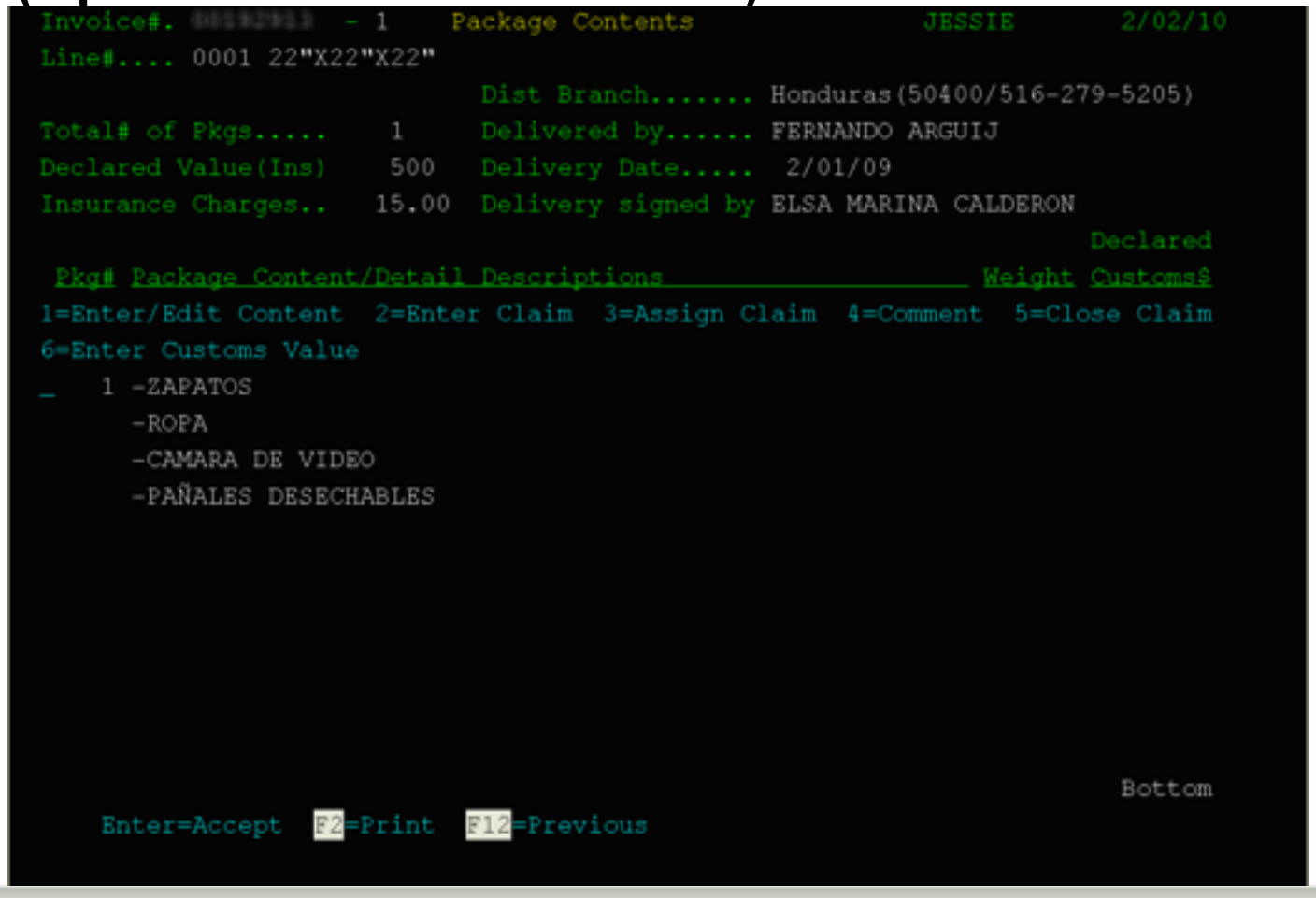
Screen #1, Order header

Screen #2, Order detail



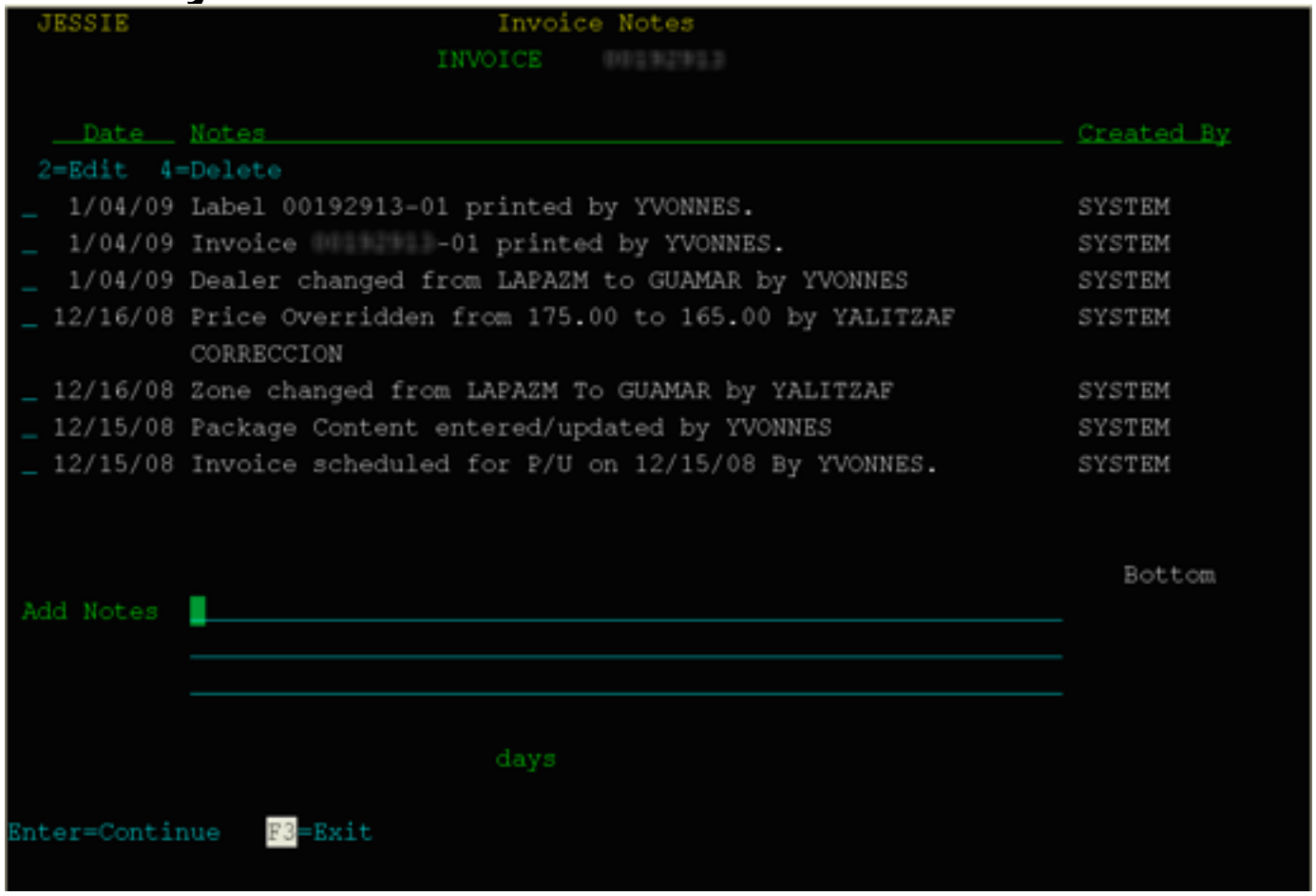
Screen #3, Content package from detail

(Option 4 from order header)

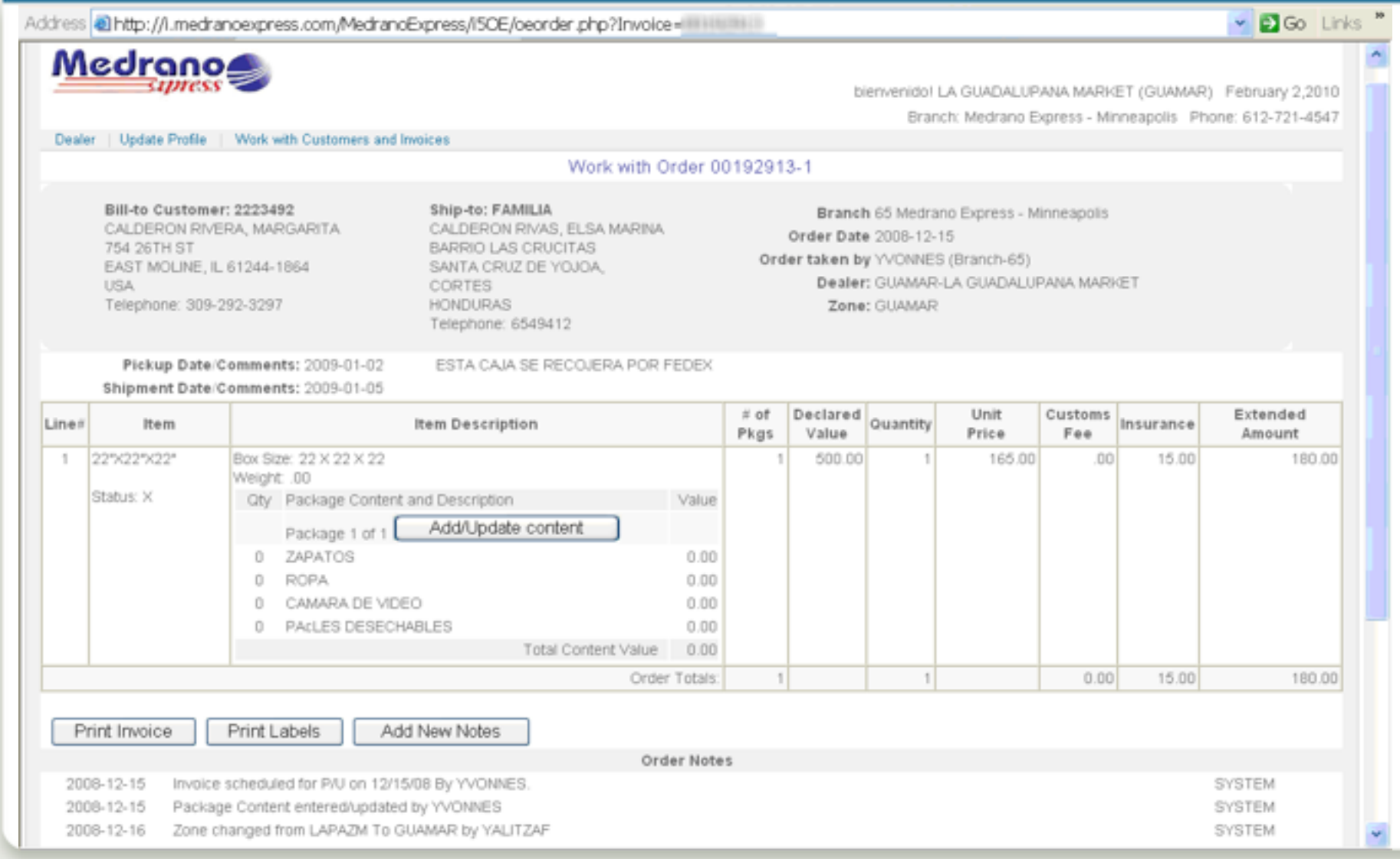


Screen #4, Notes from order detail

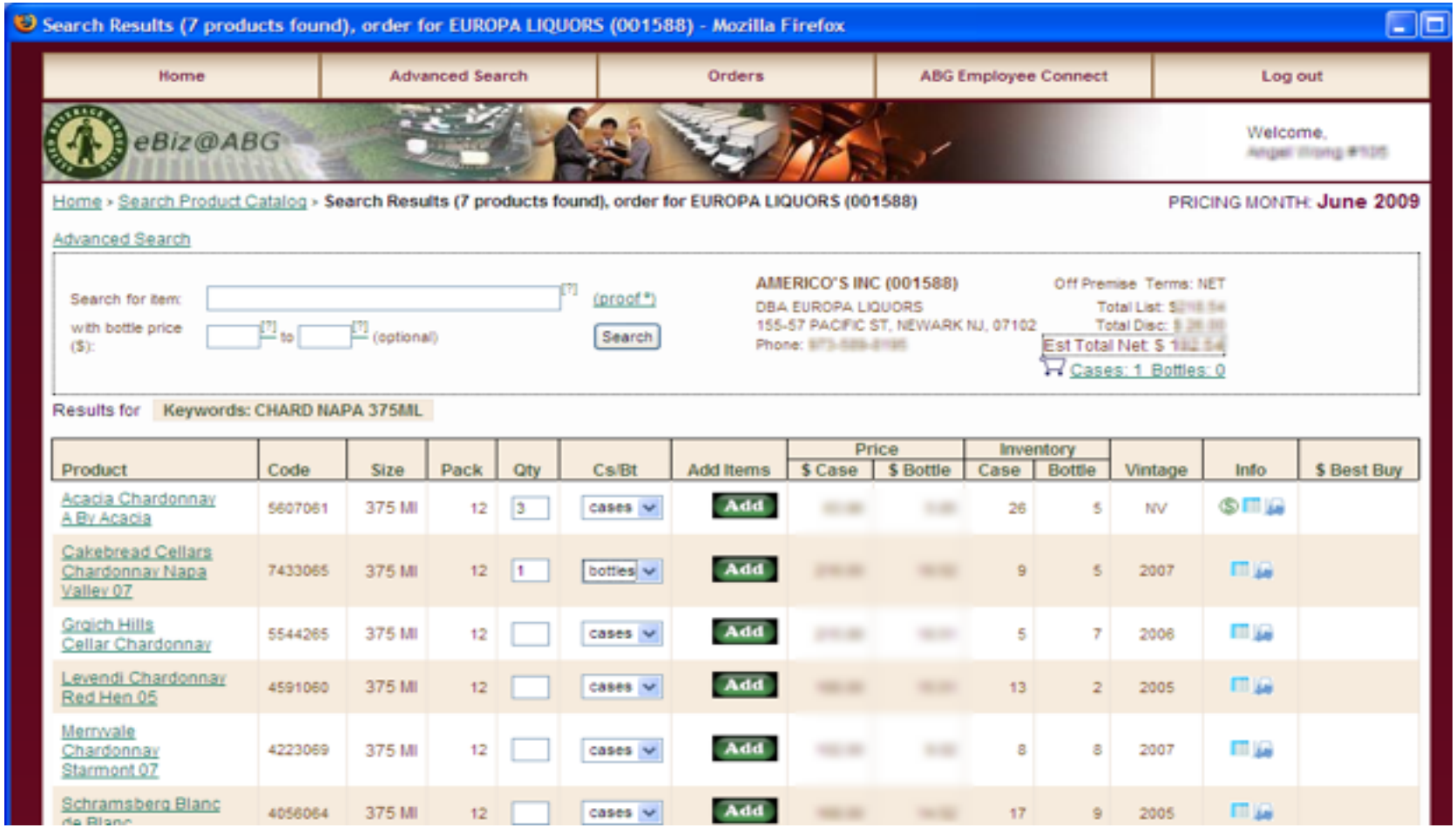
F9 key launches this



Web page combines all 4 “green screens”



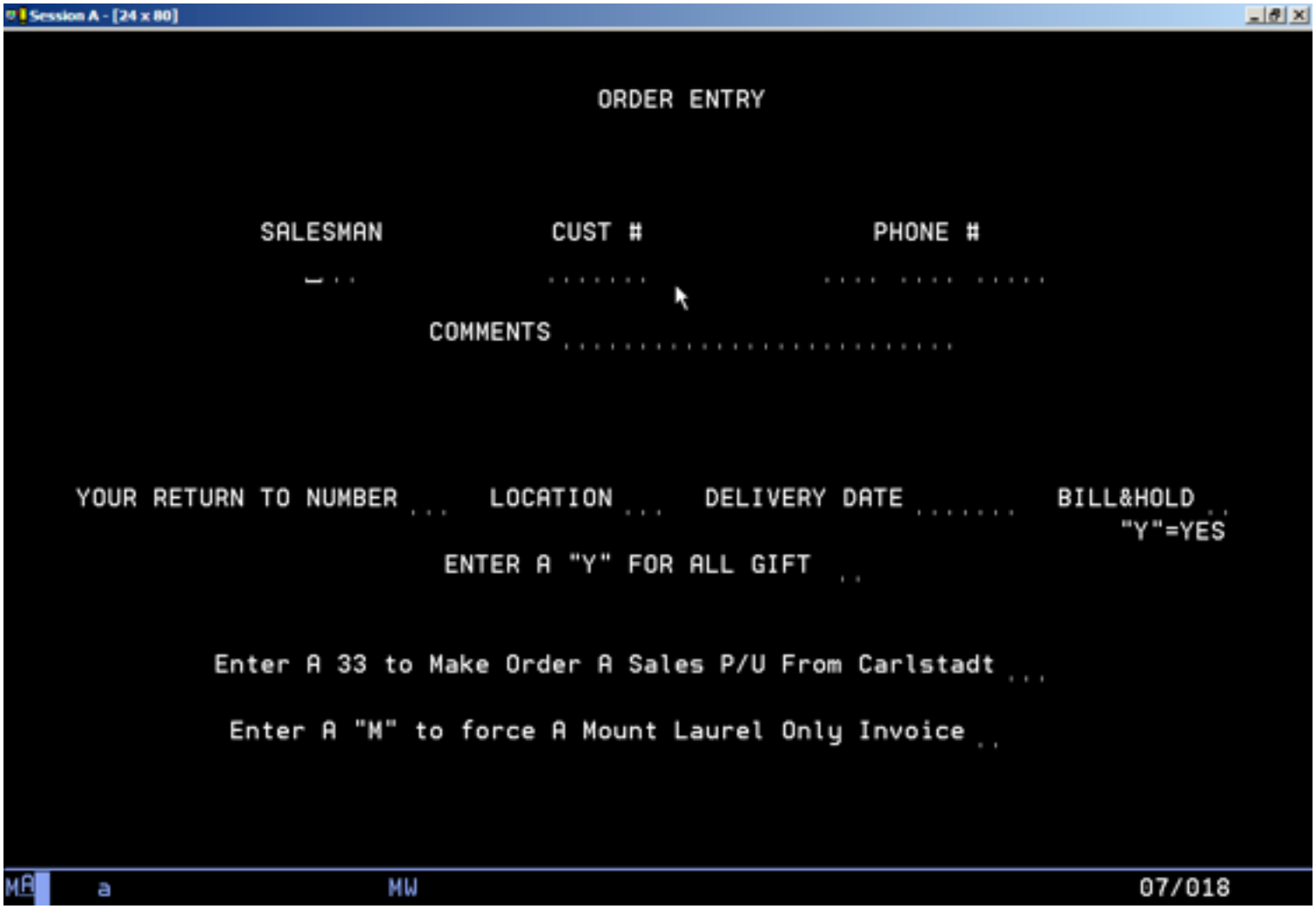
Allied Beverage Group



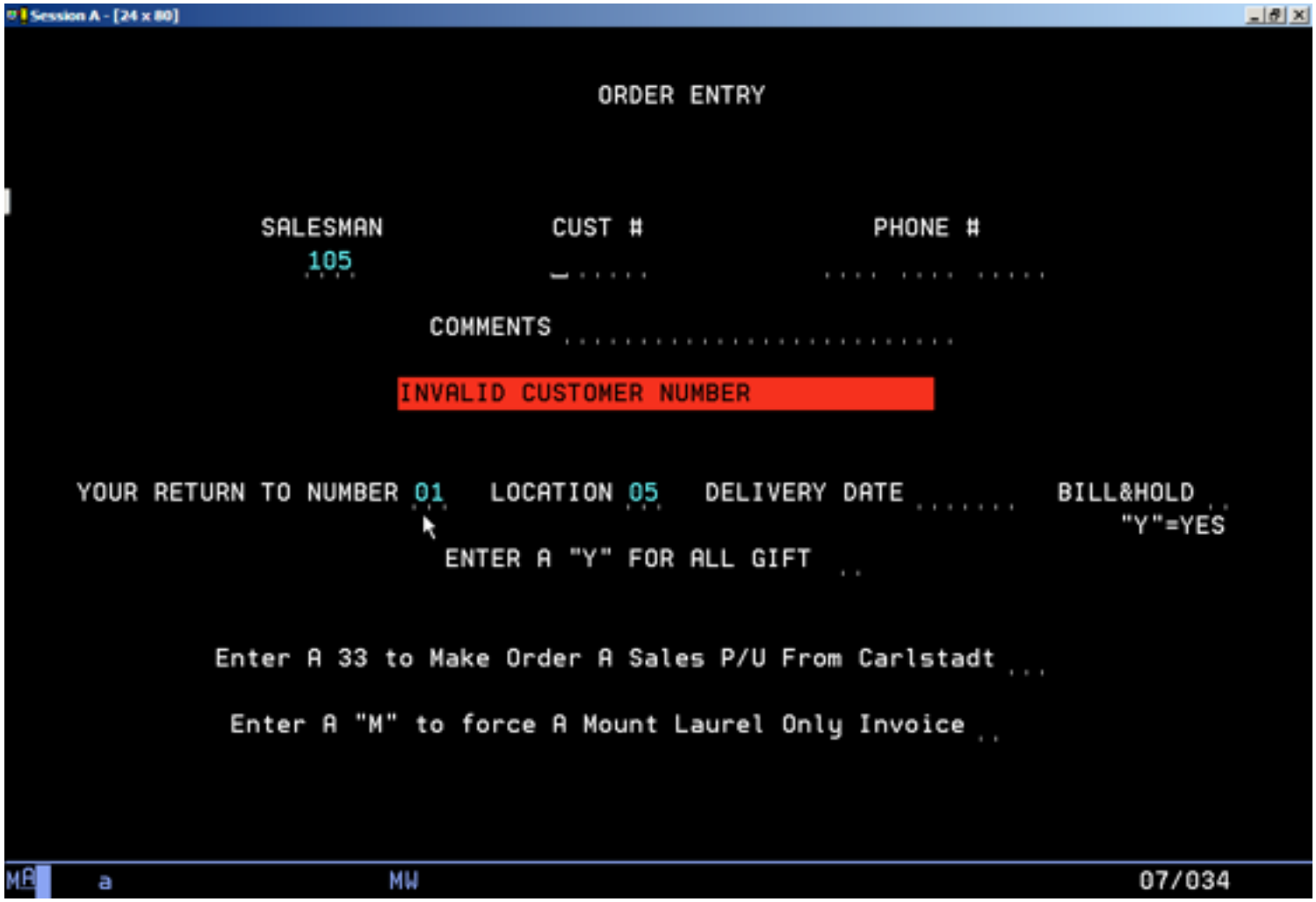
Original 5250-mode order entry process

- **Aimed at expert customer service users**
- **Sales reps accessed it using Jadvantage java applet in browser**
  - Better than nothing
  - S-l-o-w logon
  - Forced reps to have expert knowledge of system
- **Dicey wireless signals on the road = lost sessions**
- **RPG was powerful but too complex to be updated with major new functionality**

Intro screen

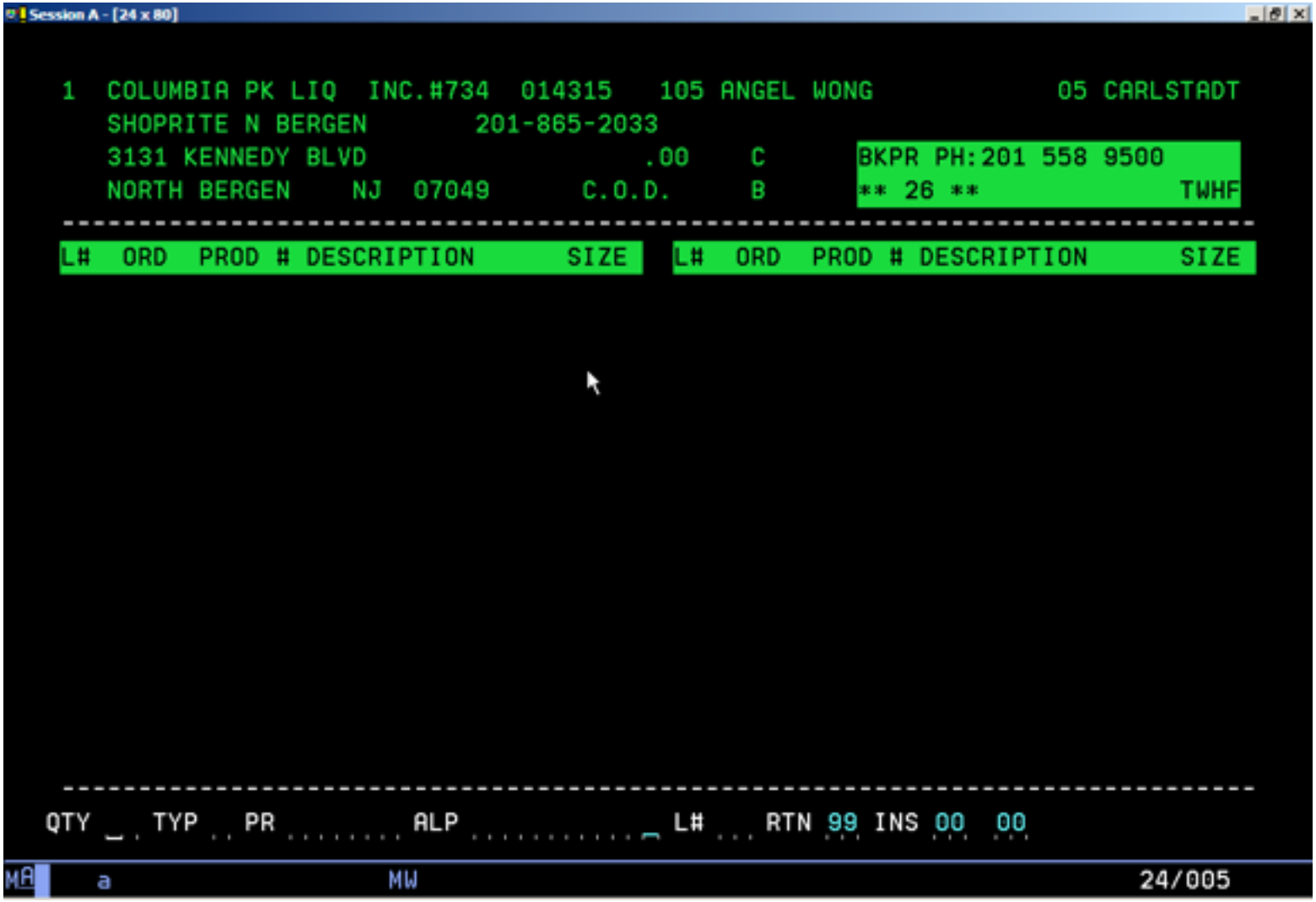


Intro with error message (customer)

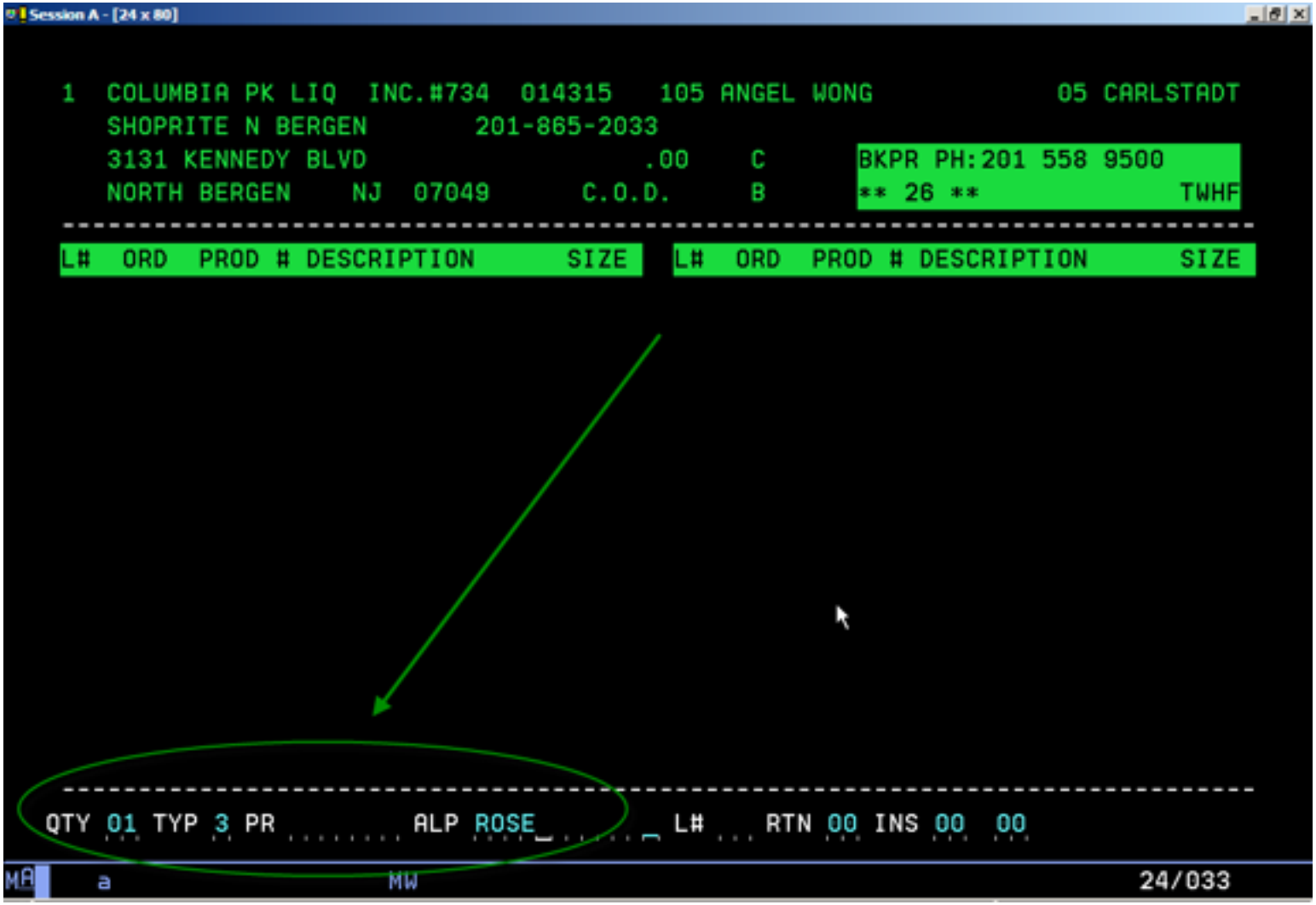


Intro with error message (“return to number”)

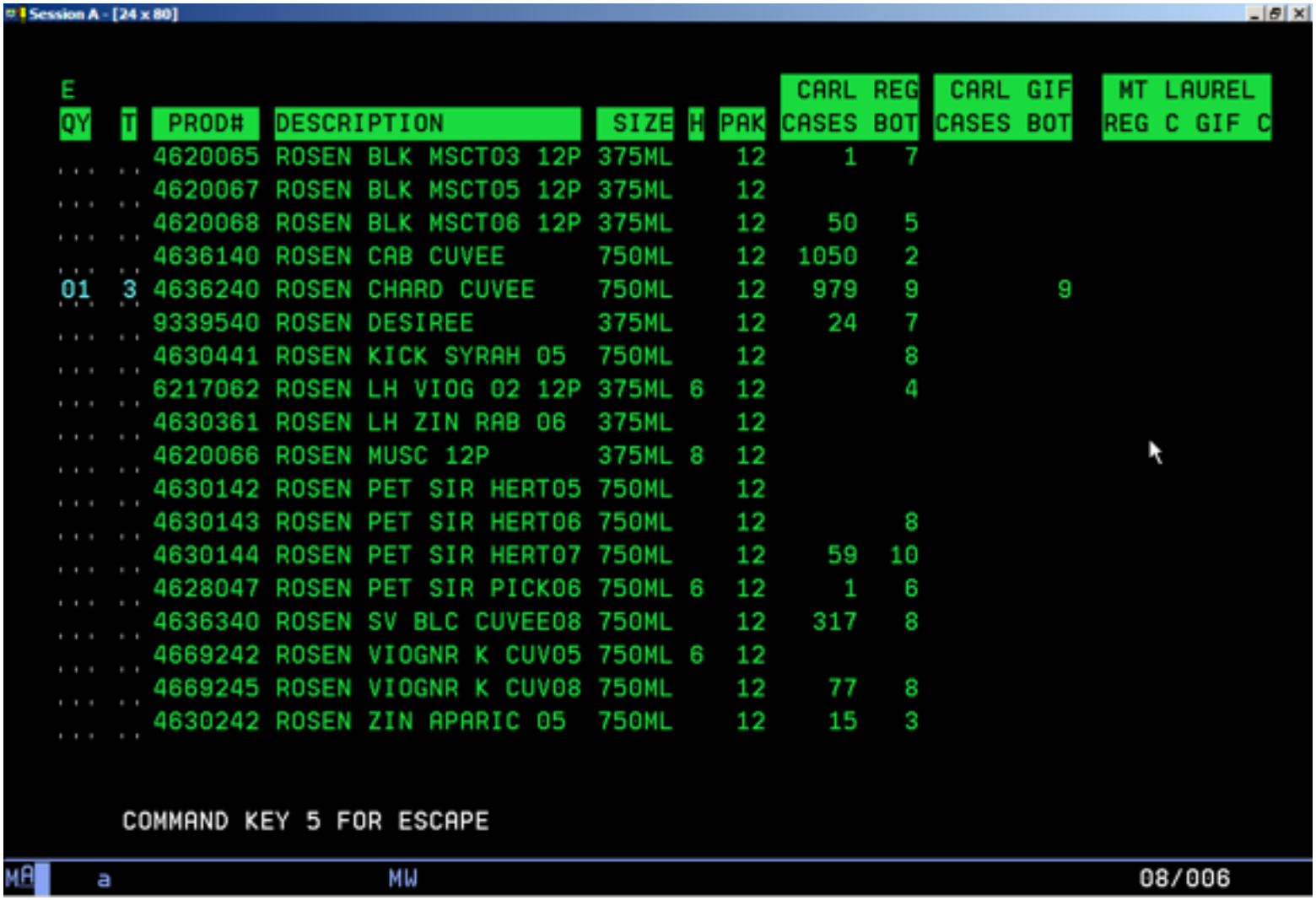
Main screen


Session A - [24 x 80]
1 COLUMBIA PK LIQ INC.#734 014315 105 ANGEL WONG 05 CARLSTADT
SHOPRITE N BERGEN 201-865-2033
3131 KENNEDY BLVD .00 C
NORTH BERGEN NJ 07049 C.O.D. B
BKPR PH:201 558 9500
** 26 ** TWHF
L# ORD PROD # DESCRIPTION SIZE
L# ORD PROD # DESCRIPTION SIZE
QTY TYP PR ALP L# RTN 99 INS 00 00
MA a MW 24/005

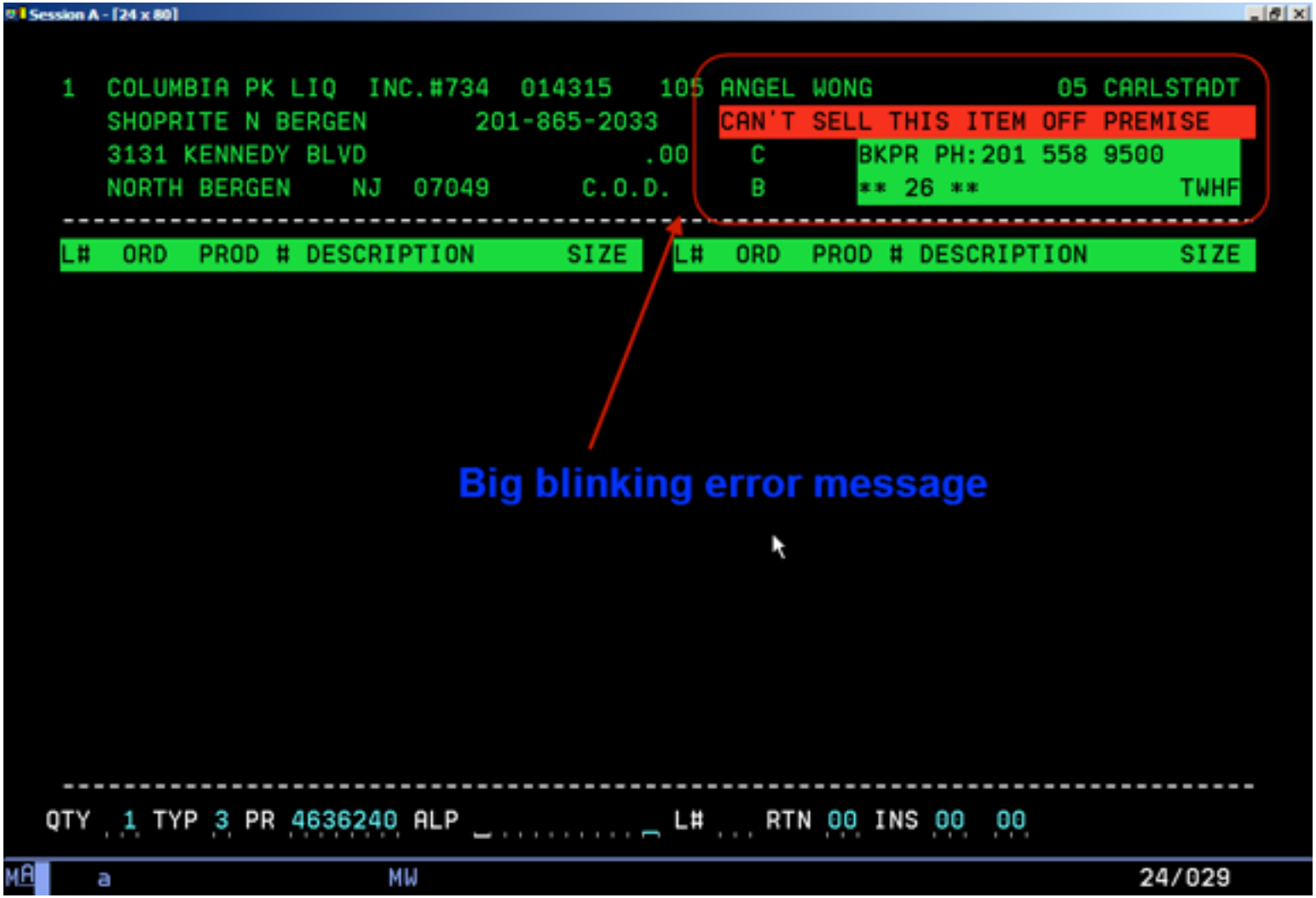
Search for a product by description



Select a product



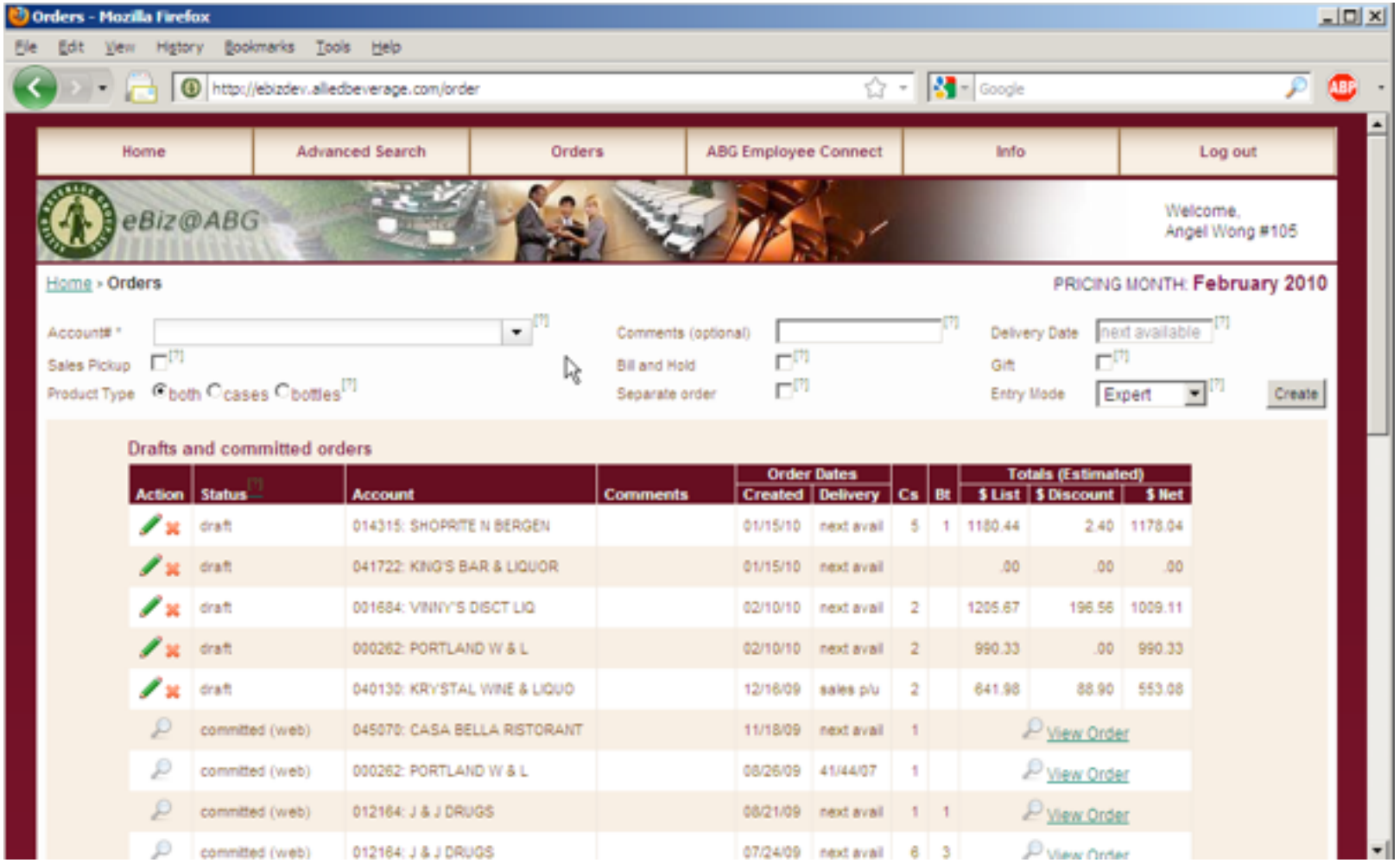
Help!


Session A - [24 x 80]
1 COLUMBIA PK LIQ INC.#734 014315 105 ANGEL WONG 05 CARLSTADT
SHOPRITE N BERGEN 201-865-2033
CAN'T SELL THIS ITEM OFF PREMISE
3131 KENNEDY BLVD .00 C BKPR PH:201 558 9500
NORTH BERGEN NJ 07049 C.O.D. B ** 26 ** TWHF
L# ORD PROD # DESCRIPTION SIZE
L# ORD PROD # DESCRIPTION SIZE
Big blinking error message
QTY 1 TYP 3 PR 4636240 ALP L# RTN 00 INS 00 00
MA a MW 24/029

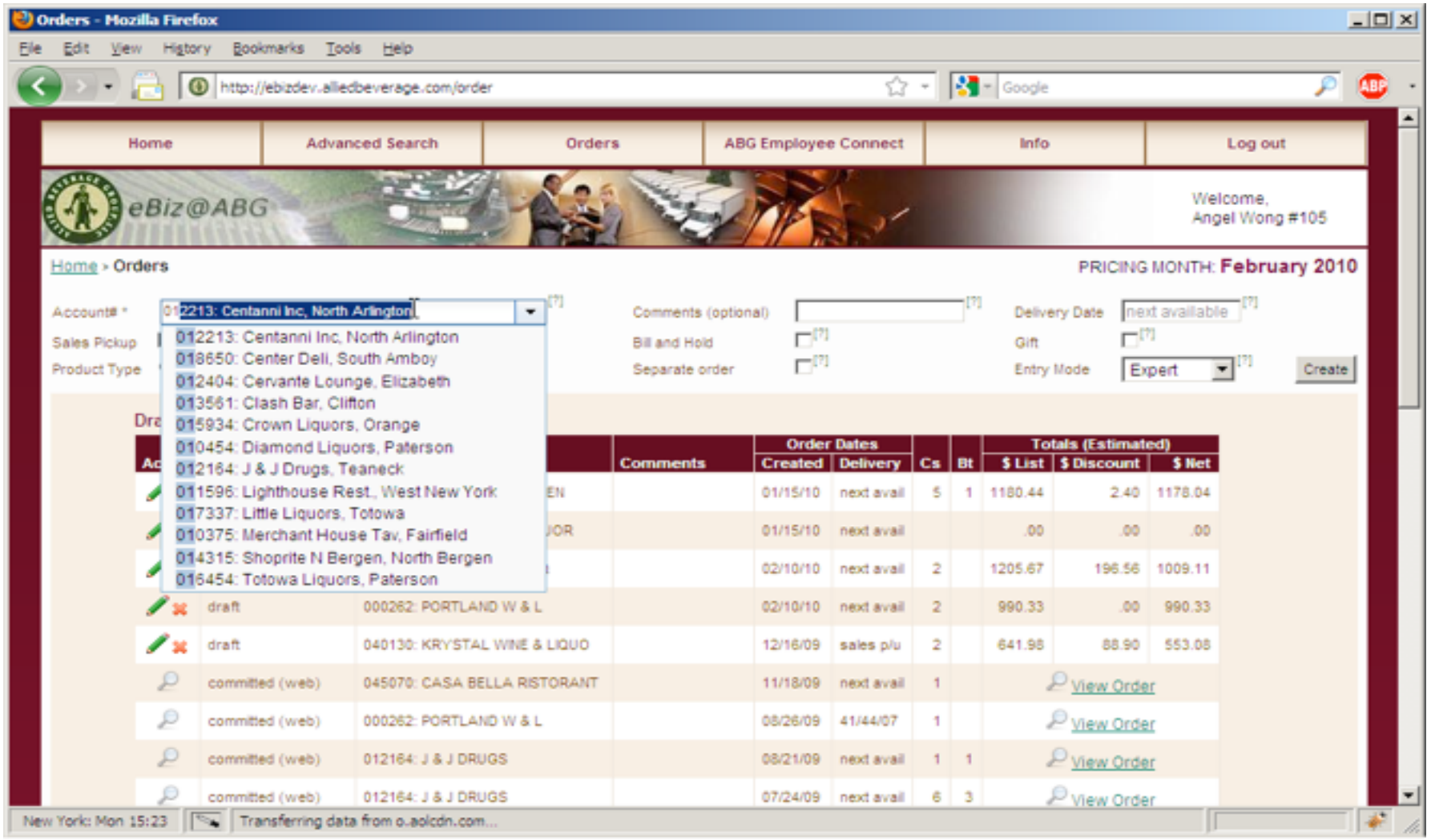
What Allied wanted in web-based order entry

- **Good for sales reps and customers**
  - Keep speed while making it easier for newcomers
  - Reps can copy from past orders
  - Lots of information at fingertips (fewer clicks)
- **Users can save drafts of orders**
  - Drafts are brand-new functionality
  - We use the old RPG logic, but we're not tied to it
- **No problem if temporarily disconnected**
  - Stateless web connection can easily resume later
- **Overcome 90-item limit**
  - So we didn't have to treat that as an error
  - Internally we split order into 90-item bunches and sent multiple orders to RPG

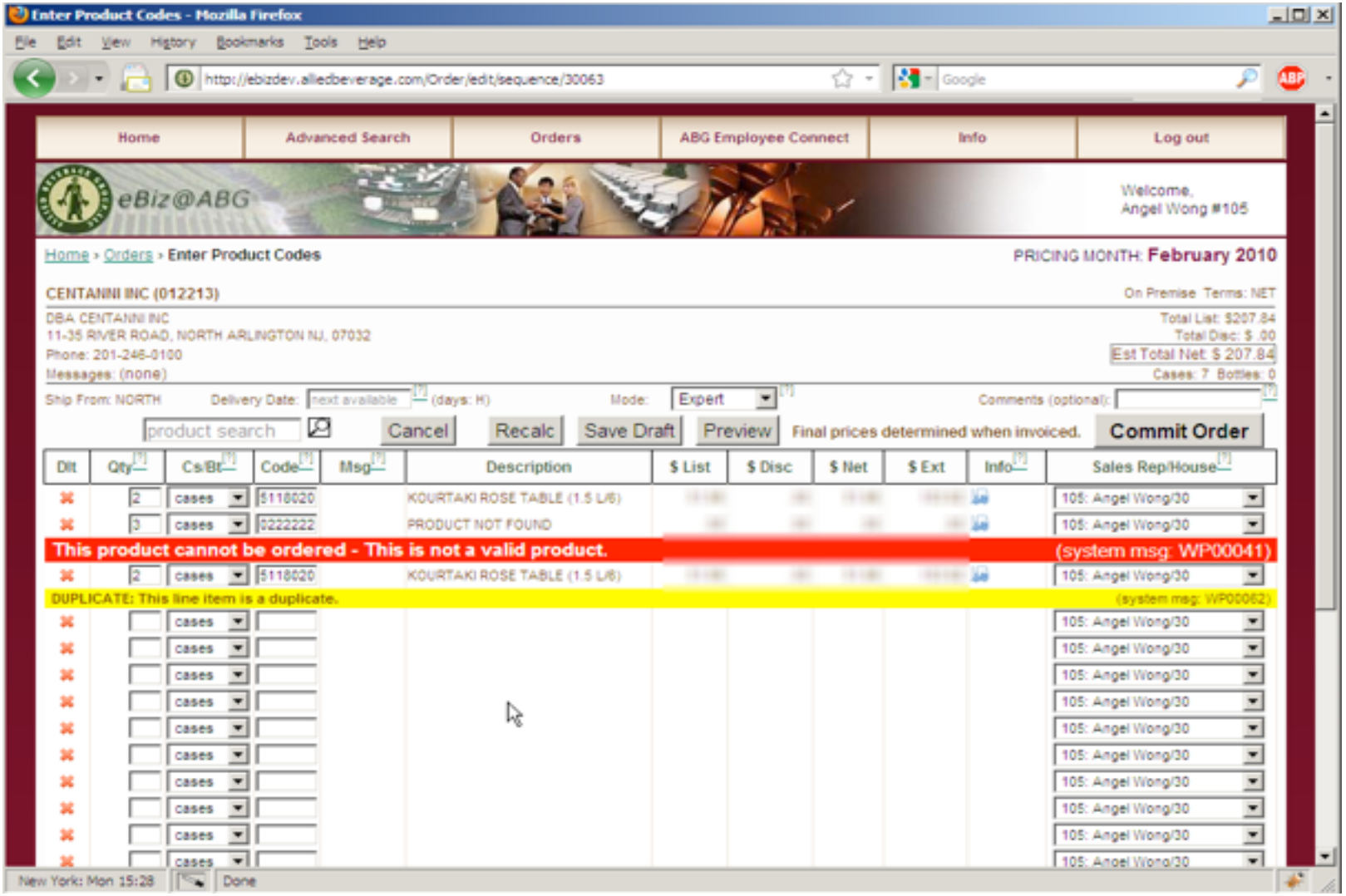
Web ordering intro page



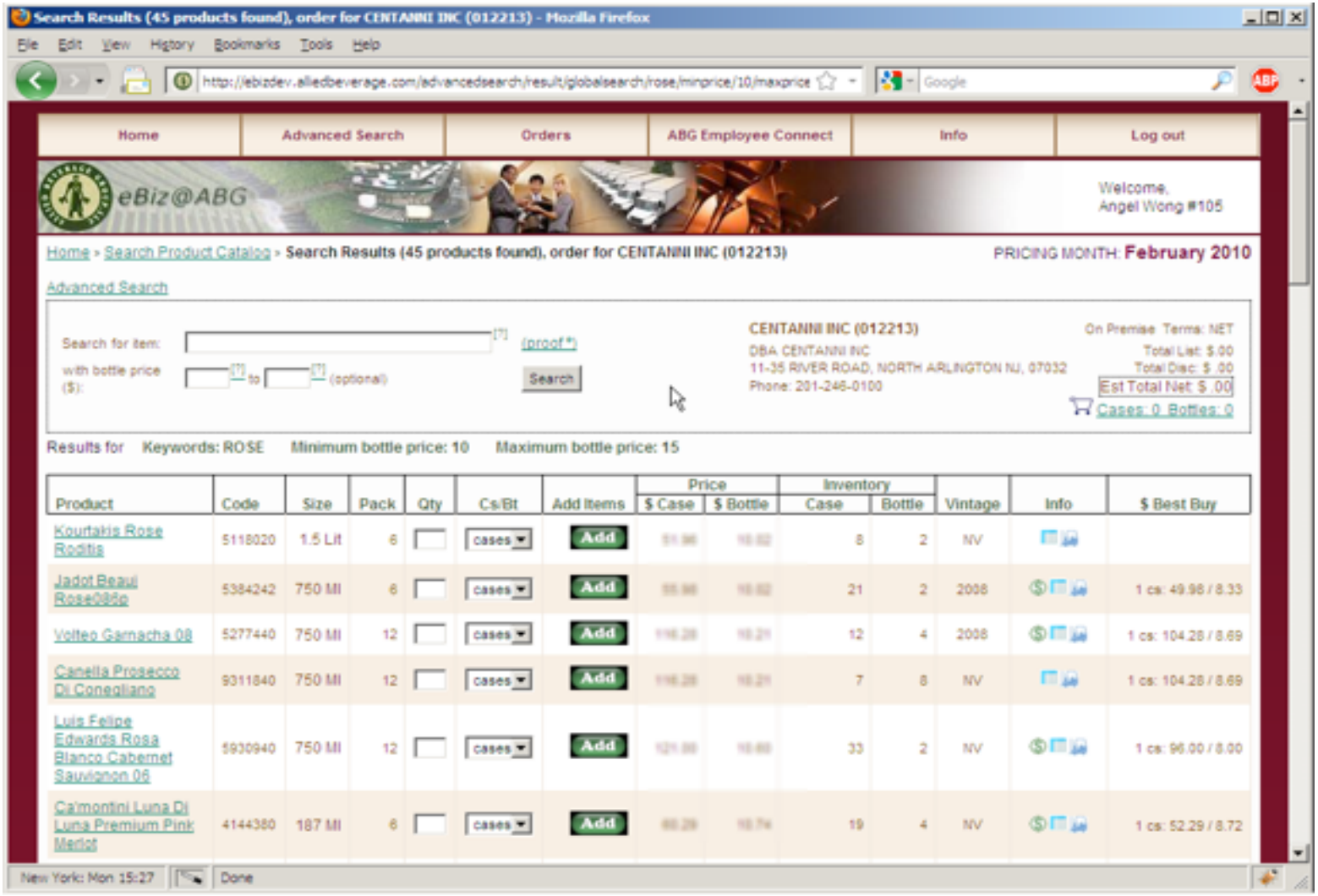
Web with account type/search box



Web Mode #1: Quick Order Entry



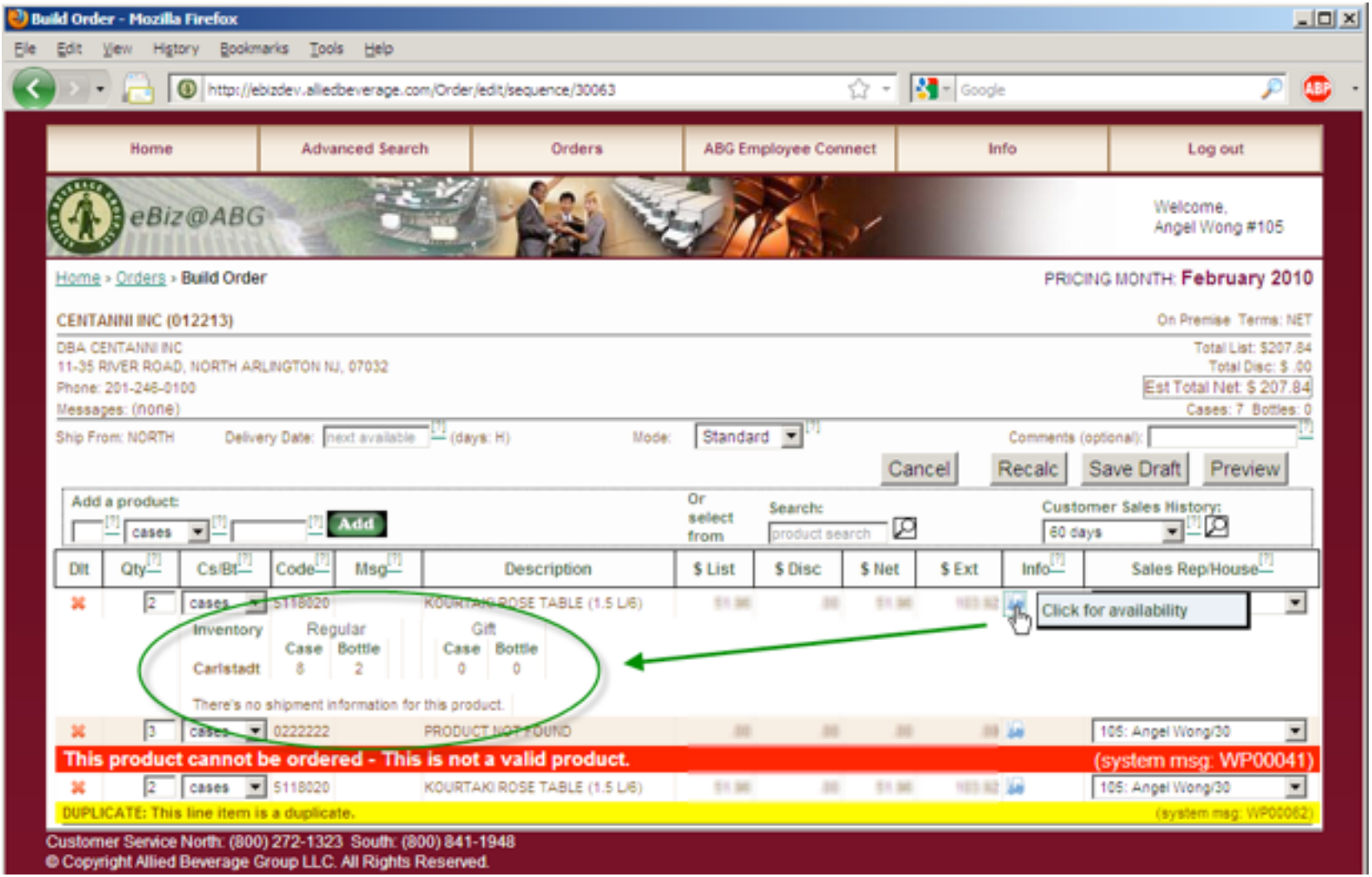
Search results



Web Mode #2: Standard Order Entry

Notice message file messages WP00041 and so on!

AJAX loads dynamic info



New web apps

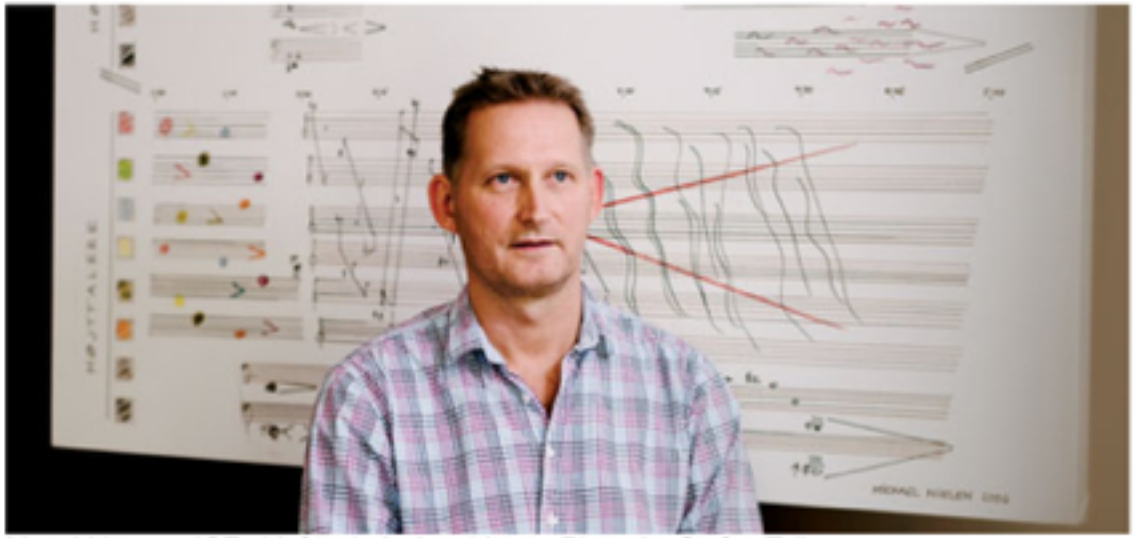
ICE award-winner

POWER > CASE STUDIES > SERVICES

Case Studies

International Copyright Enterprise Stays Atop the Music Industry by Looking Toward the Future

October 2014 | by Jim Utsler

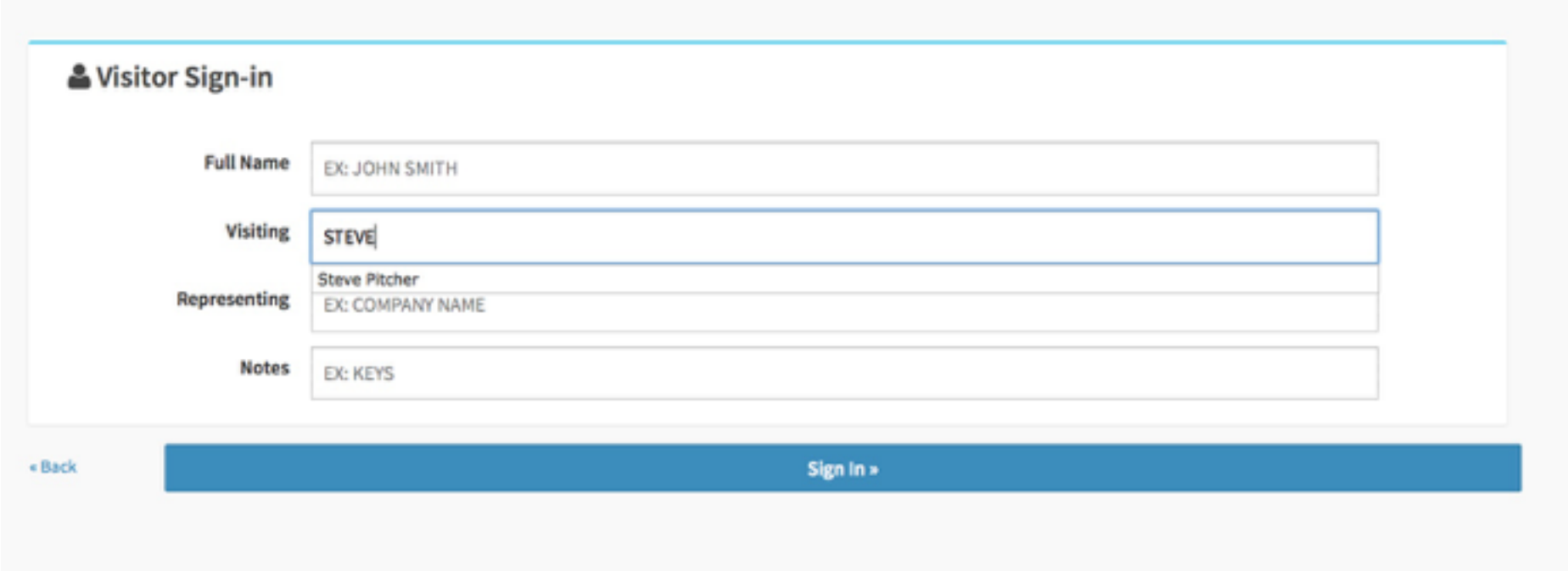


Mats Lidstrom, ICE chief technical architect - Photo by Stefan Tell

Scotsburn Dairy Group: visitor kiosk

- **Front desk kiosk-mounted touch monitor**

Scotsburn Dairy Group: visitor kiosk



- "Visiting" box has autocomplete
- Saving money on supplies
- Reducing paper use a company goal

H-P Products: executive decision tool

Tooling WC	Setup STD. Actual	Run Hours STD. Actual Remaining	Expected Completed Scrap Open	Scheduled Start Completed	Actual Comp
	.25	21.305	150	01/19/15	
00837	.25	2.96	150.000	01/19/15	
		0.345	.000		
			0		

Date	Time	Badge	Transaction	Setup Run	Complete
01/22/15	72103	400	OF	R	1
01/22/15	62322	400	ON	R	
01/22/15	62311	400	OF	S	0
01/22/15	60811	400	ON	S	
	400			1	150.800
	400			0	.800

				150	
02224		.37	12.245	150.000	01/21/15
00812		.00	.00	.000	01/21/15
			12.245	0	

Date	Time	Badge	Transaction	Setup Run	Complete
01/23/15	105917	1385	OF	R	1
01/23/15	91232	1385	ON	R	
01/23/15	91224	1385	OF	S	0
01/23/15	81640	1385	ON	S	

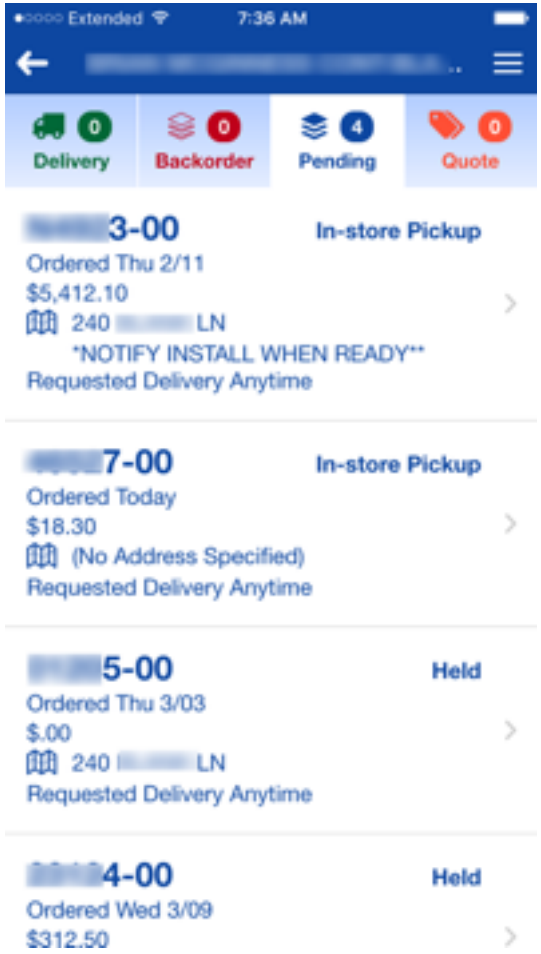
		.20	3.4	150	
00839		.00	.00	.000	01/22/15
			3.4	.000	01/22/15
				150	

- **Not pretty—but—**
- **Enables company to measure time spent on each customer**
- **Can better set prices appropriate to each customer**

Mobile applications

Mobile delivery tracker

- **Delivery tracker for a building supply company**
- **Web application optimized for mobile phones**
  - For construction contractors at a job site
- **Live IBM i data from DB2, RPG**
- **PHP, Apigility, ZF2, AngularJS/Ionic**

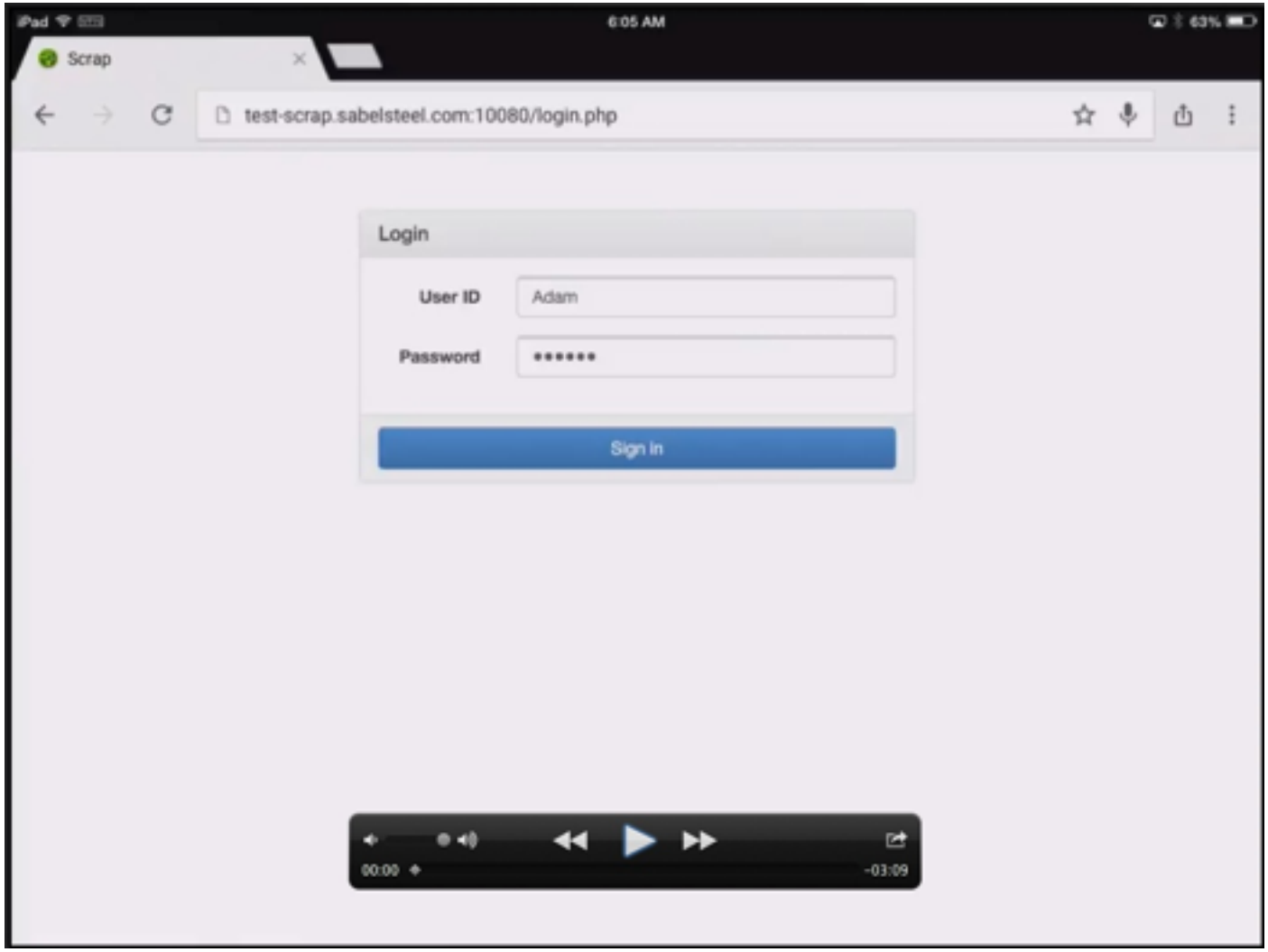


Scrap metal ordering system on iPad

- **Exciting blend of RPG, DB2, PHP, HTML5, mobile device capabilities**
- **Developer: Adam Shirley, Sabel Steel, Alabama, USA**
- **Spurred by government regulations for record-keeping**
- **See video**

- **Slides to follow:**

Scrap metal system: log in

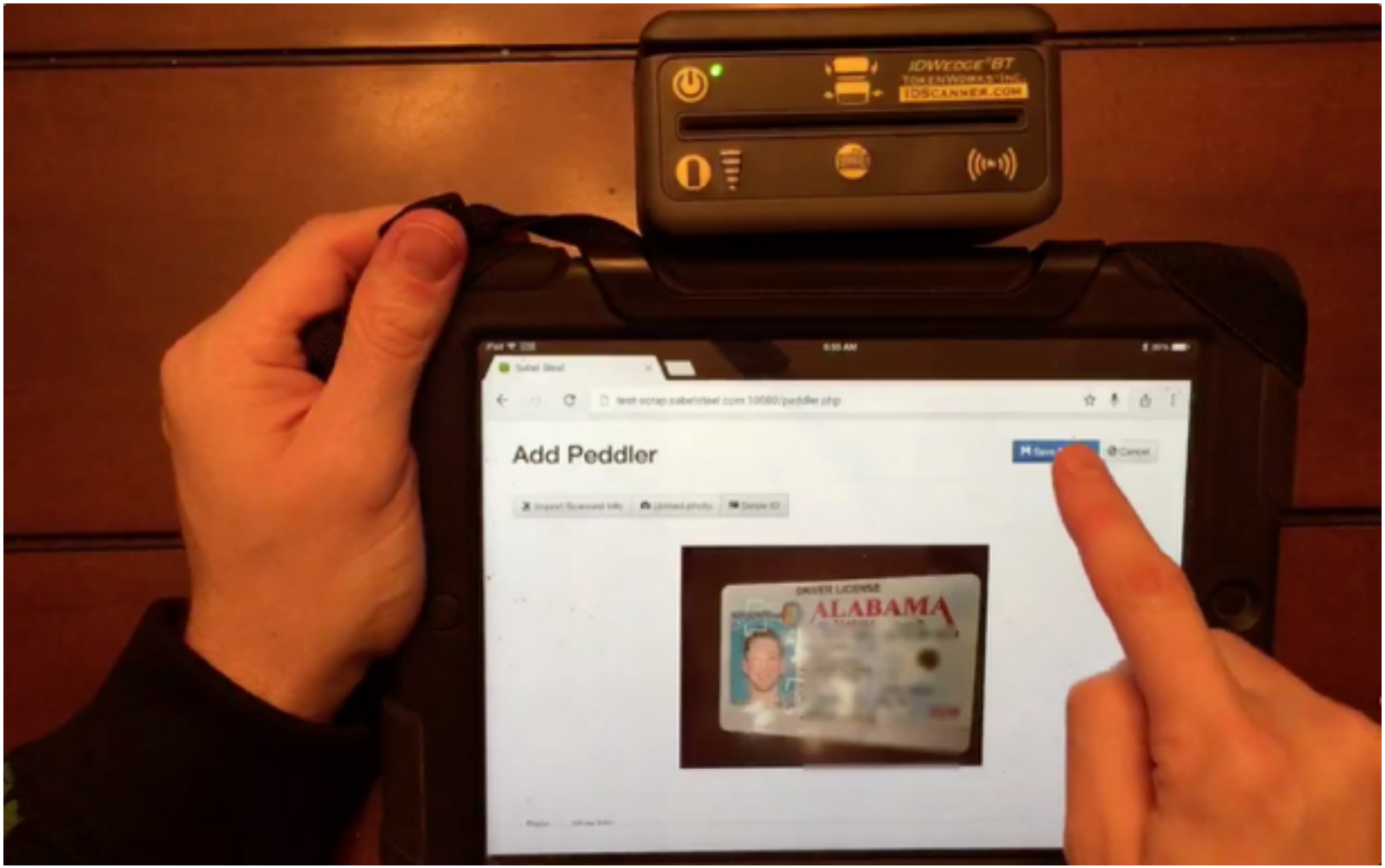


Scrap metal system: read license card

Scrap metal system: autofill ID

Scrap metal system: take photo of card

Scrap metal system: save photo to IFS/DB2



Web services

PHP can provide and consume

- **Many examples of web services with PHP (See http://alanseiden.com/presentations for more)**
- **Here is a recent example**

PHP + JSON: Pennock Floral

- **Challenge: connect RPG applications to third-party e-commerce web services using JSON**
  - IT wanted to use IBM i but did not know how
  - Simplest solution would keep RPG in control
- **Executives doubted IBM i**
  - Were about to seek a solution outside of IT
  - IT needed quick success to prove IBM i could handle HTTP + JSON

```
{
  "authenticationToken": "token_info_goes_here",
  "name": "Fuel Surcharge",
  "code": FS"
 }
```

PHP + JSON: Pennock Floral (slide 2)

- **Solution: Use PHP as "glue" to connect RPG to the JSON-based web services**
  - RPG remained simple, easy to manage
  - RPG called PHP, which handled the JSON easily
  - Pennock's head RPG developer was then able to add new service consumers himself with RPG and PHP

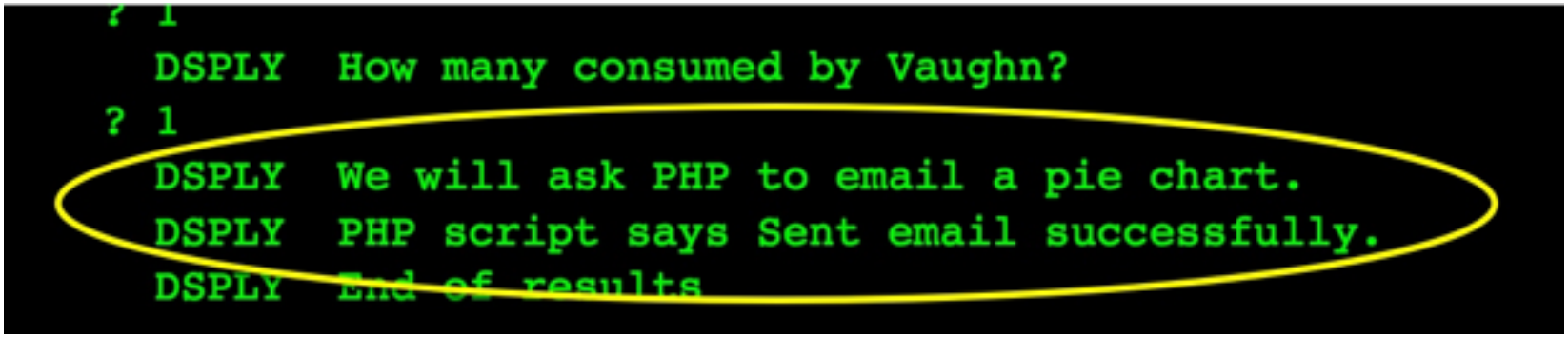
- **"You turned lead into gold"—IT Director**

Enhance RPG

PHP can even enhance RPG green screens

- Graphs, PDF files, Excel spreadsheets
  - RPG can call PHP
  - PHP can generate and email these graphical items

- Details and code in “PHP Tricks for RPG Programmers”

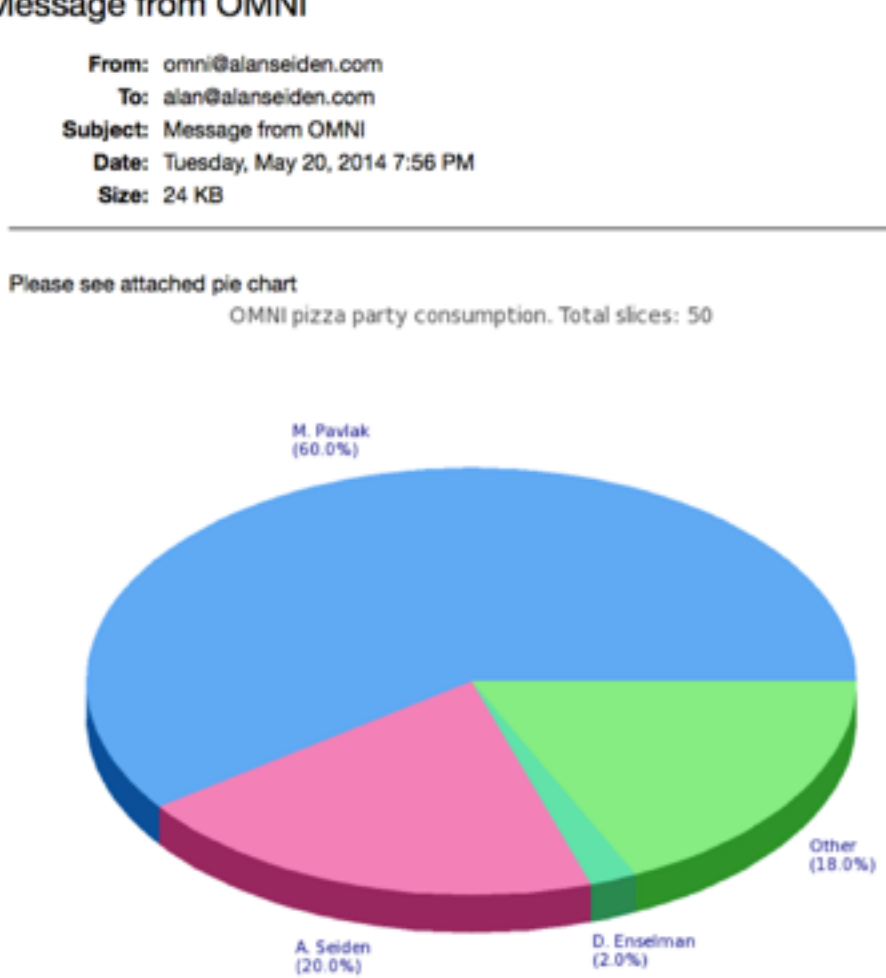


E-mail pie chart from RPG

Message from OMNI

From: omni@alanseiden.com
To: alan@alanseiden.com
Subject: Message from OMNI
Date: Tuesday, May 20, 2014 7:56 PM
Size: 24 KB

Please see attached pie chart



E-mail PDF from RPG

American Apple Pie Company **May 23, 2014**

Equity summary sample: member 9123

Year	Declared Unit Retains	Qualified Unit Retains	Non-Qualified Unit Retains	PIK
2005	.00	0.21	0.34	
2006	.00	1.21	1.34	
2007	.00	2.21	2.34	
2008	.00	3.21	3.34	
2009	.00	4.21	4.34	
2010	.00	5.21	5.34	
2011	.00	6.21	6.34	
2012	.00	7.21	7.34	
2013	.00	8.21	8.34	
2014	.00	9.21	9.34	
2015	.00	10.21	10.34	
2016	.00	11.21	11.34	
2017	.00	12.21	12.34	
2018	.00	13.21	13.34	
2019	.00	14.21	14.34	
2020	.00	15.21	15.34	

Advanced and future

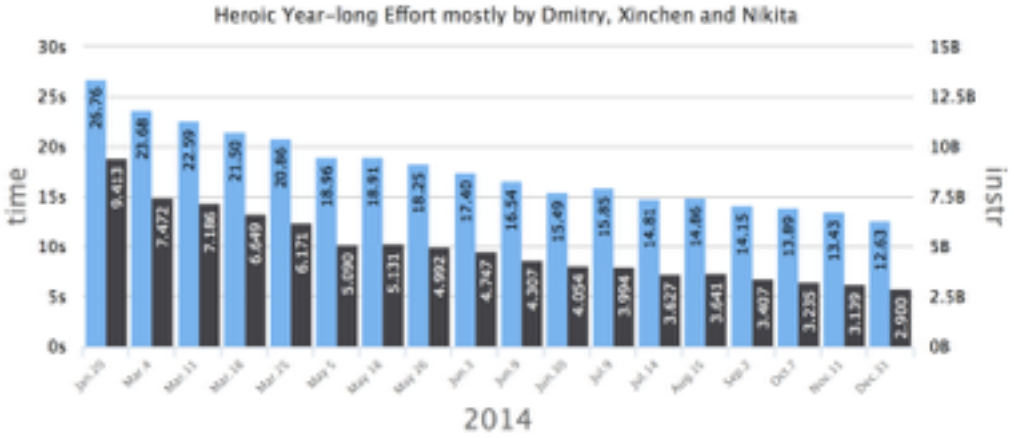
PHP grows with you

- **“Procedural style” PHP works, generally easiest for RPG programmers to learn**
  - We all start with procedural PHP
- **Object-Oriented (OO) syntax: more advanced**
  - Structure for reusing code, maintenance
- **Frameworks, APIs**
  - Zend Framework, Apigility help structure applications
  - Learn after becoming comfortable with OO style

“PHP Renaissance” and PHP 7

- **Speed boost (at least with popular apps and CMSes…let’s see about business apps)**
- **Spurred by competition with Facebook’s “Hack”**

Time and number of machine instructions for 100 requests against Wordpress-3.6.0 front page



Summary

How to start

- **Get PHP by downloading Zend Server for IBM i**
  - No charge for Basic license; prefer pro/enterprise if mission critical app
- **Use RPG and DB2 as solid foundation for business logic.**
  - **Works best if the logic is modular (smaller programs or procedures)**
- **Training and help are available. Free and paid resources**

Be creative—change perceptions of IBM i

- **Adopt open source, no-cost software**
  - Joomla, Wordpress, many others
- **Extend green screens with a GUI**
  - Web and mobile applications engage a wider audience (e.g. customers)
  - Re-use business logic. RPG still valuable
  - PHP Toolkit enables this
- **New applications: choose IBM i**
  - Automate manual processes
  - Executive dashboards to improve business decisions
  - Working with open source demonstrates commitment to your chosen platform and your career as a whole

Contact and tips

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