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Serving the People

2D Barcode Processing at Maryland

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Agenda

- Background
- Implementation
- 2001 tax season results
- Features and technology
- Plans
- Questions



Background

- IBM and Maryland formed partnership in 1993 to automate tax return processing
- 1994 - first full year of production
- 1998 - migrate to Windows NT
- 2000 - upgrade to Bancotec scanners
- 2002 - added 2D barcodes

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Goals

- Capture data and skip data repair
 - 2D data considered to be correct
- Improve data accuracy
 - 2D data read with 100% correctness
- Improve customer service
 - Fewer errors means fewer complaints
- Use existing imaging system with minimal impact

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Implementation

- Define contents of 2D barcodes
 - Which fields to include
 - Format of data
 - FTA header information
- Work with software vendors
 - 4 vendors participated
 - Several iterations to final 2D size & shape

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Implementation

- Obtain examples and test
 - Test data content, header content, ECL
 - Test readability at given barcode size and shape
- Define forms in IFP
 - 2D read area, OCR read areas, join rules
- Monitor results
 - 2D barcode administrative report with counts, read rates

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The image shows a screenshot of a Maryland tax return form. At the top, it is titled "MARYLAND TAX RETURN" and includes a barcode and a QR code. The form contains several sections for entering taxpayer information, including name, address, and Social Security Number. Below these sections is a table with multiple columns and rows, likely representing tax data or calculations. The form is densely packed with text and checkboxes.



2001 Results



2001 Results

- 114,000 2D returns received
 - 4% of total
- 94.5% were readable
- 83.5% skipped data repair
 - Refund returns: 90%
 - Remittance returns: 73%

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2001 Results

Vendor	Count	Read Rate	Skip Rate
15	55,710	93.4%	89.2%
16	4	100.0%	0.0%
34	305	98.3%	65.6%
35	46,958	95.8%	76.8%

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2001 Results

Form	Count	Read Rate	Skip Rate
123	139	97.1%	87.8%
500	1,386	93.8%	54.0%
502	77,248	94.1%	86.4%
503	9,318	96.8%	91.8%
504	618	97.8%	46.1%
505	9,789	94.5%	88.2%
510	4,118	95.4%	15.1%
515	1	100.0%	0.0%



2001 Results

Type	Count	Skip Rate
Refund	74,197	89.7%
Payment	28,204	73.3%



2001 Results

- Causes of 'unskippable' barcodes
 - Out of state filers
 - Not in taxpayer database
 - City spelling differences
 - Example: Mt Airy vs Mount Airy
 - Handprint fields
 - Not in 2D barcode, want operator to verify OCR

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2001 Results

- Causes of unreadable barcodes
 - Excessive scanner noise (e.g. vertical lines)
 - Dark barcodes
 - Faint barcodes
 - Labels on top of barcode

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2001 Results

- No change to organization
 - Document prep staff didn't need to sort returns
 - Data verification operators didn't see the barcodes (most return skipped DV anyway)
 - No reduction in DV staff (yet)
- No impact to taxpayers
- Less errors for error correction personnel
- Received several inquiries from other states

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Features and Technology

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Image-based 2D Decoder

- Developed by IBM for Maryland
- Targeted for barcodes at 200 dpi (15 mils)
- Includes FTA syntax validation
- Performs two different decoding algorithms
 - Similar to “voting” in the OCR world
- Includes erasure support
- Resorts to OCR if 2D read fails

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FTA Syntax Validation

- Optional syntax validation string to ensure barcode is correct
 - “T1/1022/MD/502/01/01”
- Used to detect incorrect or unexpected barcodes
- System logs an event and reverts to OCR if header is wrong

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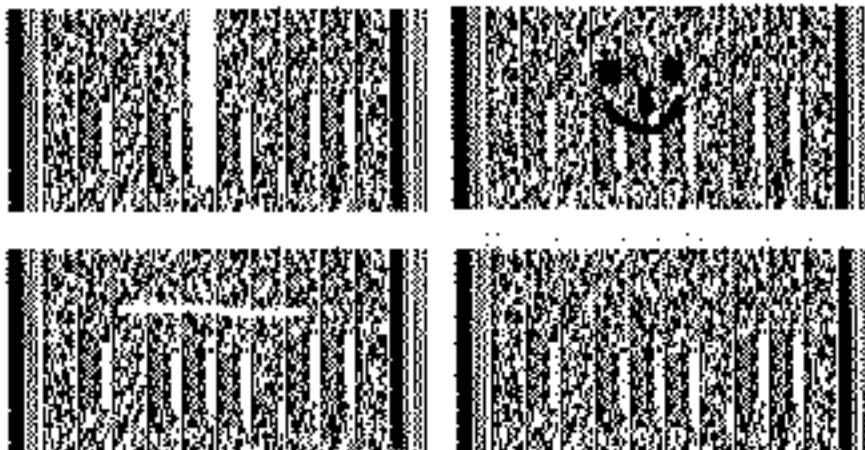
Erasure Support

- Two types of 2D read errors
 - *Misreads* (incorrect value)
 - *Erasures* (no value)
- ECL 4 (FTA standard) corrects up to 16 misreads and 16 erasures
- Without erasure support: max 16 errors
- With erasure support: max 32 errors

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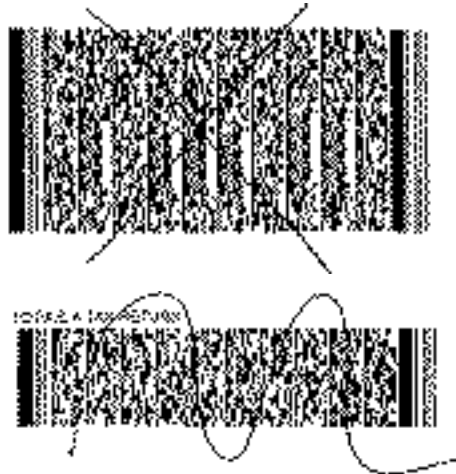
Readable Barcodes



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Readable Barcodes



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Benefits

- High read rates
- Don't need to separate 2D returns
- Get all the benefits of imaging
- Works with any scanner
- Don't need to define a separate version
- Less data repair, higher data accuracy

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Benefits

- By imaging the 2D return ...
 - Images are available and retrievable on any employee's PC
 - Return is easily retrievable for Audit and Collections purposes
 - Taxpayers receive a copy that looks exactly as the return submitted

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Plans for 2002

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Plans for 2002

- Add more vendors
- Improve skip rate based on 2001 findings
- Decrease temporary staff for DV
- Better monitoring of scan quality
- Fine tune forms design

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Questions?

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