

Mainframe Data in an Internet World

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1

Howdy to you all

- 29 Years on the Mainframe
- Goal Systems
- Legent Corporation
- CSI International
 - ◆ Vice President

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Today's Discussion

- Data Transmission
- Data Conversion
- Data Preservation
- Data Security
- Data Integrity
- Cheating

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The Historical View: Mainframes...

- Absolute Accuracy
 - ◆ Error detection/correction
 - ★ CPU
 - ★ Parity
 - ★ CRC
 - ◆ Reproducible Results

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The Historical View: Mainframes...

- Precise data structures
 - ◆ Formatted records
- Rigid user interface
 - ◆ 24 x 80
 - ◆ AID keys
 - ◆ Batch
- Automation

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The Historical View: Mainframes...

- Security
 - ◆ Passwords
 - ◆ Actual Doors
- Backups
 - ◆ Strategic
 - ◆ Tactical

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6

The Personal Computer

- Cheap
- Simple
- Flexible

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New Concepts

- Re-boot
- Soft Failure
- 99.9% Data Integrity
- Try it again
- Don't ask; Don't tell

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New Concepts

- “We don’t do backups, we have a UPS.”
- “Our RAID controller makes backups obsolete.”

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The Internet

- Designed by “PC” people
- Good Idea
 - ◆ Ubiquitous
 - ◆ Cheap
 - ◆ Fast

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The Internet

- Bad Implementation
 - ◆ Unreliable
 - ◆ Unpredictable
 - ◆ Unsecure

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The Internet

- Band-aids
 - ◆ SSL
 - ◆ Hashing

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Mainframe Needs

- Export Data
- Import Data
- User Access to Data

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Bytes or Octets?

- ASCII or EBCDIC?
 - ◆ Code Pages
- Image ("Binary")
 - ◆ Context

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Record Formats

- Mainframe:
 - ◆ Fixed / Variable
 - ◆ Blocked / Unblocked
 - ◆ Undefined
 - ◆ String
- Non-Mainframe:
 - ◆ What's a Record?

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Transferring Files

- FTP
 - ◆ Free
 - ◆ Universal
 - ◆ Can be used effectively
- Third-party software

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FTP

- TYPE A / E / I
 - ◆ “On the Wire” state
 - ◆ ASCII
 - ★ CR/LF delimiters
 - ★ Translation Table
 - ◆ EBCDIC
 - ★ NL delimiter
 - ◆ IMAGE
 - ★ No delimiters

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17

FTP

- MODE Stream; STRU File
 - ◆ A Bunch of Bytes
 - ◆ “Records” indicated by delimiters
 - ★ TYPE Image (binary) has no delimiters.
 - ◆ Default (and only) settings for most non-mainframes.

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MODE Block

- ◆ Available on Mainframes
- ◆ Record-oriented
- ◆ Works with binary data

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MODE Block

- Format
 - ◆ 1 byte – Record type
 - ★ X'80' – Last segment in record
 - ★ X'40' – Last segment in file
 - ★ X'20' – Data not reliable
 - ★ X'10' – Restart marker
 - ◆ 2 bytes – Data length
 - ◆ N bytes - Data

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20

STRU Record

- Also “mainframe only”
- Uses X'FF' as escape character
 - ◆ X'FF01' – End of record
 - ◆ X'FF02' – End of data
 - ◆ X'FF03' – EOR and EOD
 - ◆ X'FFFF' – Single byte of X'FF'

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Translation

- Code Pages
 - ◆ EBCDIC
 - ★ 037 (PL/1) →
 - ★ 1047 (C, C++) { }
 - ◆ ASCII
 - ★ 1252
- Translate Tables
 - ◆ Reversible?

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Code Page 037

HEX	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
00	00	&	-	0	Ø	°	µ	^	()	\	0
01	01	á	é	í	ó	ú	ü	ÿ	À	Á	Â	3
02	02	â	ê	Ë	ë	ì	ï	ï	Ä	Å	Æ	2
03	03	ã	ë	Ä	Ë	ç	ï	ï	Ç	Ł	Ť	3
04	04	ä	ö	Å	Ë	d	m	u	©	D	M	U 4
05	05	á	í	Ä	Ë	e	n	v	§	E	N	V 5
06	06	ä	í	Ä	Ë	f	o	w	¶	F	O	W 6
07	07	á	í	Ä	Ë	g	p	x	¼	G	P	X 7
08	08	ç	í	Ç	Ë	h	ç	¼	½	H	O	Y 8
09	09	ñ	ü	Ñ	·	i	r	z	¾	I	R	Z 9
0A	0A	í	í	í	í	í	í	í	í	í	í	í
0B	0B	š	š	š	š	š	š	š	š	š	š	š
0C	0C	<	*	%	@	δ	æ	D	ø	ü	Ö	Ü
0D	0D	()	·	·	ý	·	·	·	·	·	·
0E	0E	·	·	·	·	·	·	·	·	·	·	·
0F	0F		·	·	·	·	·	·	·	·	·	·

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Code Page 1252

Microsoft Windows Codepage : 1252 (Latin 1)

HEX	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
10	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19
20	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
30	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
40	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
50	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
60	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
70	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
80	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
90	90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
A0	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
E0	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
F0	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF

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Translation

- Packed Decimal Data
- Embedded Binary Fields
- Collating Sequence
- Padding/Truncation
- “Oddities”
 - ◆ Carriage Control

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Record Delimiters

- NL
 - ◆ Requires “TYPE E” (EBCDIC)
- CR/LF
 - ◆ Decimal 3338
- CR
- LF
- CR/CR/LF

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26

Other Considerations

- Data Integrity
 - ◆ ZIP archives
 - ◆ SSL
 - ◆ SHA hash

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Cheating FTP

- Paired Commands
 - ◆ MODE
 - ◆ STRU
 - ◆ TYPE
- QUOTE and LQUOTE
 - ◆ Force half of a paired command
- How is this useful?

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Cheating FTP

- How is this useful?
 - ◆ Temporary storage
 - ◆ X-platform processing
 - ◆ Importing data files

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Printed Listings

- “Special case” data transfer
- Straight-forward requirements
- Unidirectional
- Delimiters not a problem
- However...

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However...

- Carriage control
- Fonts
- Destination?
 - ◆ File
 - ◆ Printer
 - ◆ Other process

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What Transport?

- LPR
- FTP
- EMAIL
- HTTP
- Other

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Your Requirements

- Forms control
- Line control
- Fonts
- Display vs Paper
- Complex data
 - ◆ Bar coding
 - ◆ Setup codes

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LPR/LPD

- The original method
- Needlessly restrictive, but we're stuck with it.
- Poor protocol for "Network" printers
- Print Queues
- Data Files
- Control Files

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34

LPR/LPD

- Can carry external information
 - ◆ Jobname, etc
 - ◆ Infoprint
- Manipulation after transmission
- Lots of room for options

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FTP

- Most versatile
- Requires a server
- Fairly generic
- Not print-oriented

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Email

- Can be quite useful
- Combines listings and files
- Asynchronous
 - ◆ Receiver need not be available
- Multiple recipients

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Listing Formats

- Plain Text
 - ◆ Must use CR/LF/FF to simulate carriage control.
- ZIP Archives
 - ◆ Ensures data integrity
 - ◆ Speeds the transmission

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38

Listing Formats

- PDF
 - ◆ Industry standard
 - ◆ Preserves exact appearance
 - ★ Fonts
 - ★ Graphics
 - ★ Scalable
 - ◆ Data Integrity

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39

Listing Formats

- AFP
 - ◆ LPR listings to outboard processor
 - ◆ Modify and put back
 - ★ Carriage control
 - ★ Record structure

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40

HTTP

- Access via Web Browser
- Translation
- PDF
- Server-Side Include
- ZIP files
- SSL

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Other Methods

- Software Packages
 - ◆ Report distribution
 - ◆ Report archiving

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Call Before You Dig

- What is valuable in the data?
 - ◆ Text content? Formatting?
- Where is it going?
 - ◆ Does target support “value”?
 - ◆ Does target have restrictions?
- Are all cases accounted for?
 - ◆ Infrequent byte sequences

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43

Thank You

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44