25 years of Rexx
— a personal view

Böblingen
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Overview

Questions, questions …
All the Presidents' questions...
Who was I? My IBM job?

• Pre-University student with IBM (1970)
  – PL/I compiler, *etc.*

• BSc Electronic Engineering
  – Birmingham

• Day job: Test Tools Team
  – designing and building hardware for testing terminals such as the 3279 …
Microlink

- Used existing coax terminal link (ANR) to attach bipolar microcomputers (based on the Signetics 8X300) to mainframe
Own-time projects?

- Mostly PL/I and S/360 Assembler
  - Archaeological mapping (1974)
  - Cave surveying programs (1976)

- STET, a STructured Editing Tool (1977)
  - and lots of other VM/CMS tools

- Rex (1979)
  - a biggie: 4,000 hours to 1982
How old was I?

well, 25 years is 25 years …
Why Rex?

• CMS had EXEC … a bit like DOS BAT
  
  &CONTROL OFF  
  &IF &INDEX EQ 0 &GOTO -GO  
  EXEC DCOPT DROP  
  &IF &RETCODE GE 12 &EXIT  
  -GO  
  &STACK RT …

• EXEC 2: clean design, but just as ugly  
  – language committee (Stephenson et al.)  
  – hooks for vanilla CMS by Michel Hack
What were the first Rex programs?

- ADDR EXEC … searches nickname file for nickname, displays name and address
- SEND EXEC … send file to a local user
- CONC XEDIT … concatenate and flow
- … and lots of testcases
Who used it?

• First distributable code was in May 1979; until then, only the one user

• The first real users (pioneers, guinea pigs, trend-setters, …) were
  – Ray Mansell (Hursley, UK)
  – Les Koehler (Raleigh, NC)

lots of useful feedback
How did it catch on?

- Internal IBM network, VNET, rapidly growing
- VM Newsletter (Peter Capek)
- Word of mouth, Xmas card …
- Add-ons (Steve Davies’ functions and others)
Was there a Rex motto?

• Sort of. Pinned to the wall over my desk in Hursley was …
Was there a Rex motto?

- Sort of. Pinned to the wall over my desk in Hursley was ...

Keep the language small
How did it become ‘official’?

• SHARE talk in 1981 … Ted Johnston (SLAC) asked IBM CEO (Cary) for Rex

• New versions of CMS included usability tools, based on XEDIT, with many macros and Execs developed in Rex

• Claude Hans in Endicott decided to add Rexxx even before EXEC 2 shipped
Why SIGNAL?

- Early addition to Rex (1979)

- Intended as an exception mechanism (quit from deeply nested programs)
  - but there was no way to propagate it up through CMS calling mechanism (SVC 202)
  - NetRexx uses Java exception mechanism, which works just as originally intended:

  ```java
  signal NumberFormatException
  ```
Why decimal arithmetic?

• One type = characters = decimal

• Current is third iteration, May—July 1981
  – lots of input from language committee
  – … and from user in 43 countries
  – … and from a ‘no more changes’ lobby

• NUMERIC DIGITS solved the ‘what precision?’ arguments
Why are ‘!’ and ‘?’ in symbols?

• I always intended to complete the arithmetic by adding Infinity and NaN
  
  ! was to be used for Infinity
  ? was to be used for NaN

• Code freeze for product meant these and other changes (e.g., stream I/O) omitted
  – so EXECIO had to be used for files
The idea behind parse templates?

- Designed from the ground up, inspired by VM/CMS commands and macros
  - ‘SET FONT Times Roman’
    Template: word1 word2 remainder
  - ‘COPY A A A = = B (REPLACE’
    Template: stuff ‘(‘ options ‘)’
Why ‘REXX’?

• Trademark search in 1982 found an unrelated product called Rex-80

• Lawyers insisted that ‘X’ be added … … and ‘REXX’ not be used in product name … and acronym was expanded

• Estimated cost of the change: $1,000,000+
Rexx is 5. 1984?

• Big Blue was watching me (though I didn’t know it) 😊

• Rexx is now public, in VM/CMS

• MFC is working on image processing

• Charles Daney is working on Personal Rexx for the PC
Rexx, Lexx — any connection?

• Oxford University Press (with IBM) was computerizing the OED (21,000 pages, 60 million words keyed, SGML markup)

… but they had no good way of editing it

• Hence the Lexx editor for Lexicographers
  – programmable by Rexx macros
<entry>
  <hwpsec><html>bungler</html> (pron) b(I)o</I>ŋglər</pron>.
  Also &lt;v&gt;6&lt;/v&gt; &lt;v&gt;bungler&lt;/v&gt;, &lt;v&gt;7&lt;/v&gt;
  &lt;v&gt;bunglar&lt;/v&gt;.
  &lt;xra&gt;&lt;xlem&gt;er&lt;/xlem&gt;&lt;hom&gt;'&lt;/hom&gt;&lt;/xra&gt;.&lt;/etym&gt;
  &lt;sen&gt;One who bungles; a clumsy unskilful worker. &lt;/sen&gt;&lt;quot&gt;&lt;qdat&gt;1533
  &lt;/qdat&gt;&lt;auth&gt;More &lt;/auth&gt;Answ. Poyson. Bk. &lt;/wk&gt;Wks. (1557) 1089/1
  &lt;qtxt&gt;He is even but a very bungler. &lt;/qtxt&gt;&lt;quot&gt;&lt;qdat&gt;1642
  &lt;/qdat&gt;&lt;auth&gt;Milton &lt;/auth&gt;Apol. Snect. &lt;/wk&gt;Wks. 1738 I. 127
  &lt;qtxt&gt;If any Carpenter, Smith, or Weaver, were such a bungler in his
  Trade. &lt;/qtxt&gt;&lt;quot&gt;&lt;qdat&gt;1820 &lt;/qdat&gt;&lt;auth&gt;Irving
  &lt;/auth&gt;Sketch Bk. &lt;/wk&gt;II. 326 &lt;qtxt&gt;A bungler at all...sports that
  required...patience or adroitness. &lt;/qtxt&gt;&lt;quot&gt;&lt;qdat&gt;1858
  &lt;/qdat&gt;&lt;auth&gt;Hawthorne &lt;/auth&gt;Fr. & I. Jrnls. &lt;/wk&gt;I. 292 &lt;qtxt&gt;The
  greatest bungler that ever botched a block of marble. &lt;/qtxt&gt;&lt;quot&gt;
  <sen param=t>Hence blembungler-like&lt;/blem&gt; &lt;pos&gt;a.&lt;/pos&gt; and
  &lt;pos&gt;adv.&lt;/pos&gt;
  &lt;/sen&gt;&lt;quot&gt;&lt;qdat&gt;1603 &lt;/qdat&gt;&lt;auth&gt;Florio &lt;/auth&gt;Montaigne
  &lt;/wk&gt;(1634) 491 &lt;qtxt&gt;That Painter...having bungler-like drawn...some Cockes.
  &lt;/qtxt&gt;&lt;quot&gt;&lt;qdat&gt;1613 &lt;/qdat&gt;&lt;auth&gt;Cotgr.,
  &lt;/auth&gt;&lt;qtxt&gt;&lt;i&gt;Rudement&lt;/i&gt;...ruggedly, harshly, bunglarlike.
  &lt;/qtxt&gt;&lt;/quot&gt;&lt;/entry&gt;
bungler (బంగ్లర). Also b bongler, 7 bungalr.
[f. as prec. + -ER1.]

One who bungles; a clumsy unskilful worker.  
1533 MORE Answ. Poyson. Bk. Wks. (1557) 1089/1  
He is even but a very bungler. 1642 MILTON  
Apol. Smect. Wks. 1738 I. 127 If any Carpenter,  
Smith, or Weaver, were such a bungler in his  
Trade. 1820 IRVING Sketch Bk. II. 326 A bungler  
at all..sports that required..patience or  
adroitness. 1858 HAWTHORNE Fr. & It. Jrnls. I.  
292 The greatest bungler that ever botched a  
block of marble.

Hence bungler-like a. and adv.  
1603 FLORIO Montaigne (1634) 491 That  
Painter..having bungler-like drawn..some Cockes.  
1613 Cotgr., Rudement..ruggedly, harshly,  
bungalrlike.
<entry>
  <hwsec>
    <hwlg>bungler</hwlg>
  </hwsec>
  <pron>b</pron>
  <vfl>Also</vfl> b, <vfl>bongler</vfl>, <vfl>bunglar</vfl>
  <etym>f. as prec. + <xra>-ER</xra>, <hom>4</hom></etym>
  <sen>One who bungles; a clumsy unskilful worker.</sen>
  <quot>
    <qdat>1533</qdat>
    <auth>MORE</auth>
    <wk>Answ. Poyson. Bk. Wks. (1557) 1089/1
    <qtxt>He is even but a very bungler.</qtxt>
  </quot>
  <quot>
    <qdat>1642</qdat>
    <auth>MILTON</auth>
    <wk>Apol. Smeck. Wks. 1738 I. 127
    <qtxt>If any Carpenter, Smith, or Weaver, were such a bungler in his Trade.</qtxt>
  </quot>
  <quot>
    <qdat>1820</qdat>
    <auth>IRVING</auth>
    <wk>Sketch Bk. II. 326
    <qtxt>A bungler at all..sports that required..patience or adroitness.</qtxt>
  </quot>
  <qdat>1858</qdat>
The second five years?

• Lots of new Rexx implementations (MVS, AIX, AS/400, OS/2, etc., and compilers)

• Rexx added to IBM System Applications Architecture
  – with its own Architecture Review Board, etc.

• Object REXX started (1988, shipped in 1996)
The third five years?

- 20+ Rexx books published 1990–1994 (including *The Rexx Language, 2nd Ed.*)

- Works starts on ANSI Rexx (published 1996)

- SLAC has over 5,000,000 lines of Rexx

- MFC writes PMGlobe and a web server (GoServe) … customized by Rexx
PMGlobe then ...
... and now
GoServe response time graph
The fourth five years?

• 14 more Rexx books published

• ANSI Rexx published; Object REXX ships for OS/2, Windows, Linux, and AIX

• MFC ports Java to OS/2 (1995), then bootstraps NetRexx with Rexx (1996/7)
Rexx improvements in NetRexx?

• Most popular: -- notation for comments

• Keyword loop for do constructs that loop

• All constructs integrate exceptions (catch) and exit code (finally), and can be labeled

• Compare is caseless
• Truly keyword-free

• Cleaner stem notation: `bark['pup'] = 'yap'
  – consistent with arrays: `array[4] = 'four'

• Self-defining hex constants: `2x81 → -127`
  – and escapes in string literals

• New `trace var a b c` (Mansell request, 1979)
... more

• Select case:

```plaintext
select case i+1
  when 1       then say 'one'
  when 1+1     then say 'two'
  when 3, 4, 5 then say 'many'
end
```

• dropped **numeric fuzz**, stack, commands

• function tweaks (e.g., `upper()`, `lower()`)

33
The fifth quinquennium?

- NetRexx interpreter in 2000–2001; since then I’ve been a bit quiet on Rexx …

  … I’ve been busy making Rexx arithmetic “mainstream” (Java, IEEE 754, hardware, XML, C, C++)

- yet languages are heading in the Rexx direction …
Rexx-like trends?

- Ruby: Rexx-like do-end and other constructs
- Python: similar look and goals as Rexx
- VB.Net: more like NetRexx than BASIC

… obscure notations have had their day
The future for Rexx ...

- Rexx style, goals, and achievements are as important now as they were in 1979
  - readability, simplicity, portability, people time is valuable, decimal arithmetic ...

- There are many ways to evolve Rexx (NetRexx and Object REXX are examples)
  - and other languages can be enhanced with Rexx features
The future for Rexx?

• Rexx will continue to be successful as long as it continues to evolve along with computing …

… and that is in your hands.
Questions?