

40 years of Rexx

— a personal view

Hursley

23 September 2019

Mike Cowlshaw

<http://speleotrove.com/mfc/>



Overview

40 years of Rexx; a timeline ...

Overview

40 years of Rexx; a timeline ...

... or, in reality, 50 years ...

Rexx roots go back 50 years...

In 1969 my mathematics teacher at Monkton Combe School, Julian Bewick, taught me to program using a pseudo-assembler (paper-executed) called '*minlan*'; I soon learned FORTRAN IV and wrote an interpreter for *minlan* ...

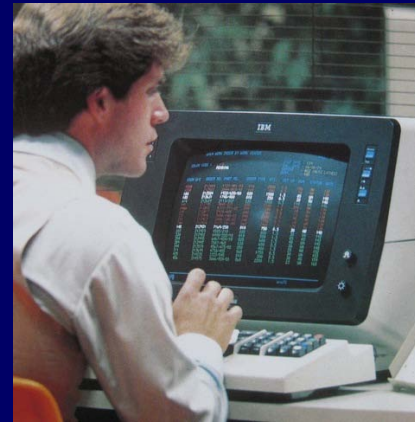
... and on 28 September 2019 we'll be celebrating those early days at the school!

Then ... (1970-1974)

- MFC: Pre-University student with IBM (1970)
 - PL/I compiler, compiler for *minlan*, *etc.*
- BSc Electrical & Electronic Engineering (1974)
 - University of Birmingham
 - Vacation jobs at IBM Hursley and IBM Bristol
 - lots of caving
 - First paper: “The Characteristics and Use of Lead-Acid Cap Lamps” (1974)

Then ... (1974-1979)

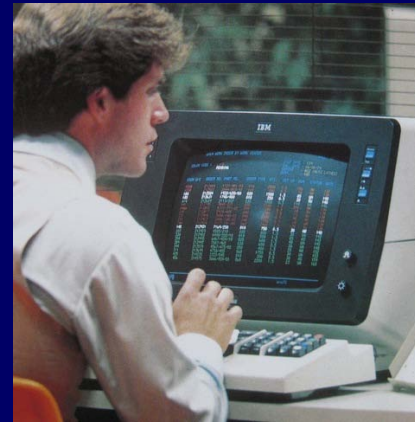
- IBM Hursley: Test Tools Team (1974-1979)
 - building hardware for testing terminals such as the 3279 ...



The team (December 1978)
(Ron Bowater, Doug Buttiner, Dave
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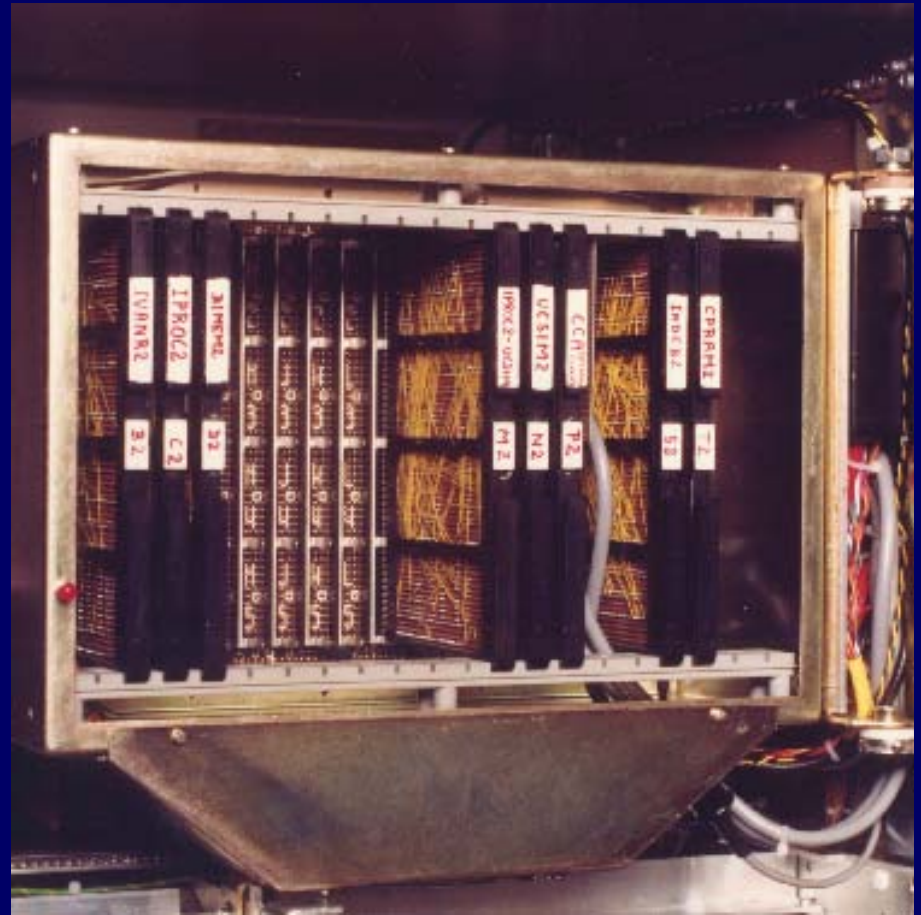
The team (October 2018)

(Dave Milward, Doug Buttimer,
Ron Bowater, MFC, Nick Butler)

... 2019 reunion today!

Microlink

- Used existing coax terminal link (ANR) to attach bipolar microcomputers (such as the 250ns Signetics 8X300) to mainframe
- Software included OS, Compilers, circuit layout ...



Own-time projects

- Mostly PL/I and S/360 Assembler
 - Archaeological mapping (1974)
 - Cave surveying programs (1976)
 - Several compilers and interpreters (1976+)
- STET, a STructured Editing Tool (1977)
 - and *lots* of other VM/CMS tools
- Rex (started 20 March 1979)
 - a biggie: 4,000 hours to 1982

How old was I?

well, 40 years is 40 years ...

How old was I? (1979 pix)



After Cueva Toyu — Guinness ceremony

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

The first Rex programs

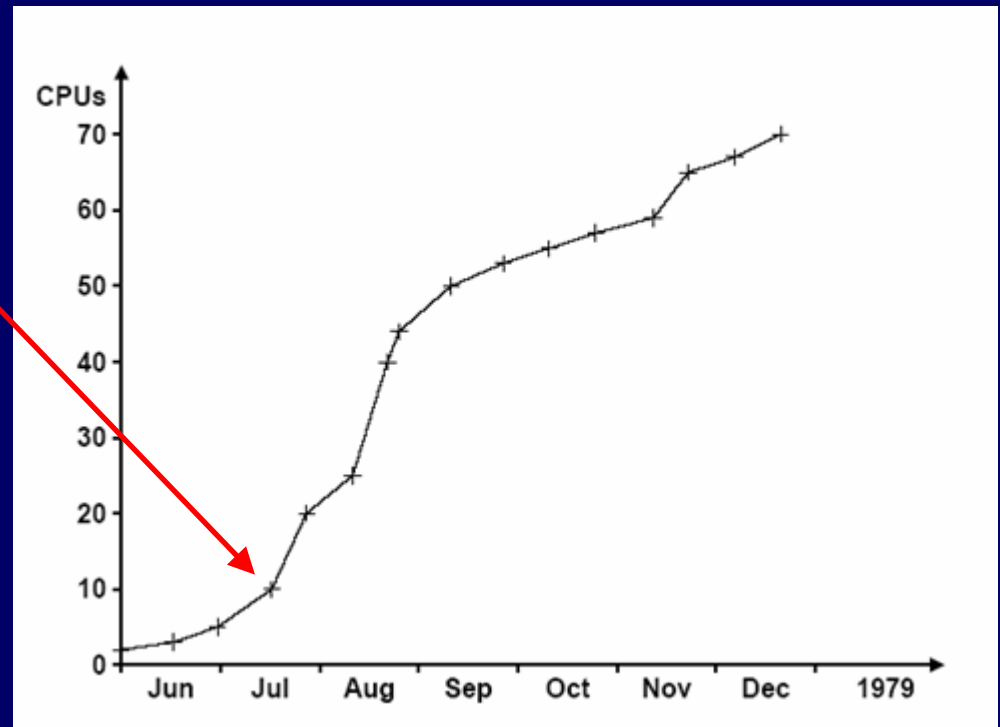
- ADDR EXEC ... searches nickname file for nickname, displays name and address
- SEND EXEC ... send file to a local user
- CONC XEDIT ... concatenate & flow macro
- ... and lots of testcases

Who used Rex?

- 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 many others)



Was there a Rex motto?

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

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Keep the language small

..... < 32 KB!

Why decimal arithmetic?

- One type = characters = decimal
 - avoids many problems (e.g., $0.9/10 = 0.089999996$)
 - see <http://speleotrove.com/decimal/decifaq1.html>
- Current is third iteration, May—July 1981
 - lots of input from language committee
 - ... and from users in 43 countries
 - ... *and* from a noisy ‘no more changes’ lobby

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

1981: How did it become 'official'?

- Internal CMS included XEDIT-editor-based tools, almost all developed using Rex
- Claude Hans in Endicott decided to add Rex even before EXEC 2 shipped; Rick McGuire involved from March 1981
- SHARE talk in 1981 ... Ted Johnston (SLAC) asked IBM CEO (Frank Cary) for Rex

1981: A setback...

- IBM PC announced in August
The very first thread on the new 'IBMPC FORUM' was: "who's writing Rex for the PC?" – many keen volunteers ...
- ... but a group in San Jose was officially funded to write Rex for PC – so no one else tried; unfortunately they wrote it in Pascal – so the project failed

1982: 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+

1984: Rexx is 5

- Rexx is now public, in VM/CMS, and widely used
- MFC is working on image processing (and writing the Rexx 'Blue Book')
- Charles Daney is working on Personal Rexx for the PC

1985: Rexx, Lexx – related?

- 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>
<hwsec><hwgp><hwlem>bungler</hwlem> <pron>b<I>ʊ</I>ˈŋɡləɹ</pron>.
</hwgp><vfl>Also <vd>6</vd> <vf>bongler</vf>, <vd>7</vd>
<vf>bunglar</vf>. </vfl><etym>f. as prec. +
<xra><xlem>-er</xlem><hom>1</hom></xra>.</etym>
<sen>One who bungles; a clumsy unskilful worker. </sen><quot><qdat>1533
</qdat><auth>More </auth><wk>Answ. Poyson. Bk. </wk>Wks. (1557) 1089/1
<txt>He is euen but a very bungler. </txt></quot><quot><qdat>1642
</qdat><auth>Milton </auth><wk>Apol. Smect. </wk>Wks. 1738 I. 127
<txt>If any Carpenter, Smith, or Weaver, were such a bungler in his
Trade. </txt></quot><quot><qdat>1820 </qdat><auth>Irving
</auth><wk>Sketch Bk. </wk>II. 326 <txt>A bungler at all..sports that
required..patience or adroitnes. </txt></quot><quot><qdat>1858
</qdat><auth>Hawthorne </auth><wk>Fr. & It. Jrnls. </wk>I. 292 <txt>The
greatest bungler that ever botched a block of marble. </txt></quot>
<sen para=t>Hence <blem>bungler-like</blem> <pos>a.</pos> and
<pos>adv.</pos>
</sen><quot><qdat>1603 </qdat><auth>Florio </auth><wk>Montaigne
</wk>(1634) 491 <txt>That Painter..having bungler-like drawn..some Cokes.
</txt></quot><quot><qdat>1613 </qdat><auth>Cotgr.,
</auth><txt><I>Rudement</I>..ruggedly, harshly, bunglarlike.
</txt></quot></entry>

```

bungler (bʊˈŋɡləɹ). Also 6 **bongler**, 7 **bunglar**.
[f. as prec. + -ER¹.]

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```

1986 – 1987

- Lots of new Rexx implementations (MVS, AIX, AS/400, MUSIC, Unix, *etc.*)
- Rexx added to IBM System Applications Architecture
 - with its own Architecture Review Board, *etc.*
- Major disagreement over Rexx in OS/2

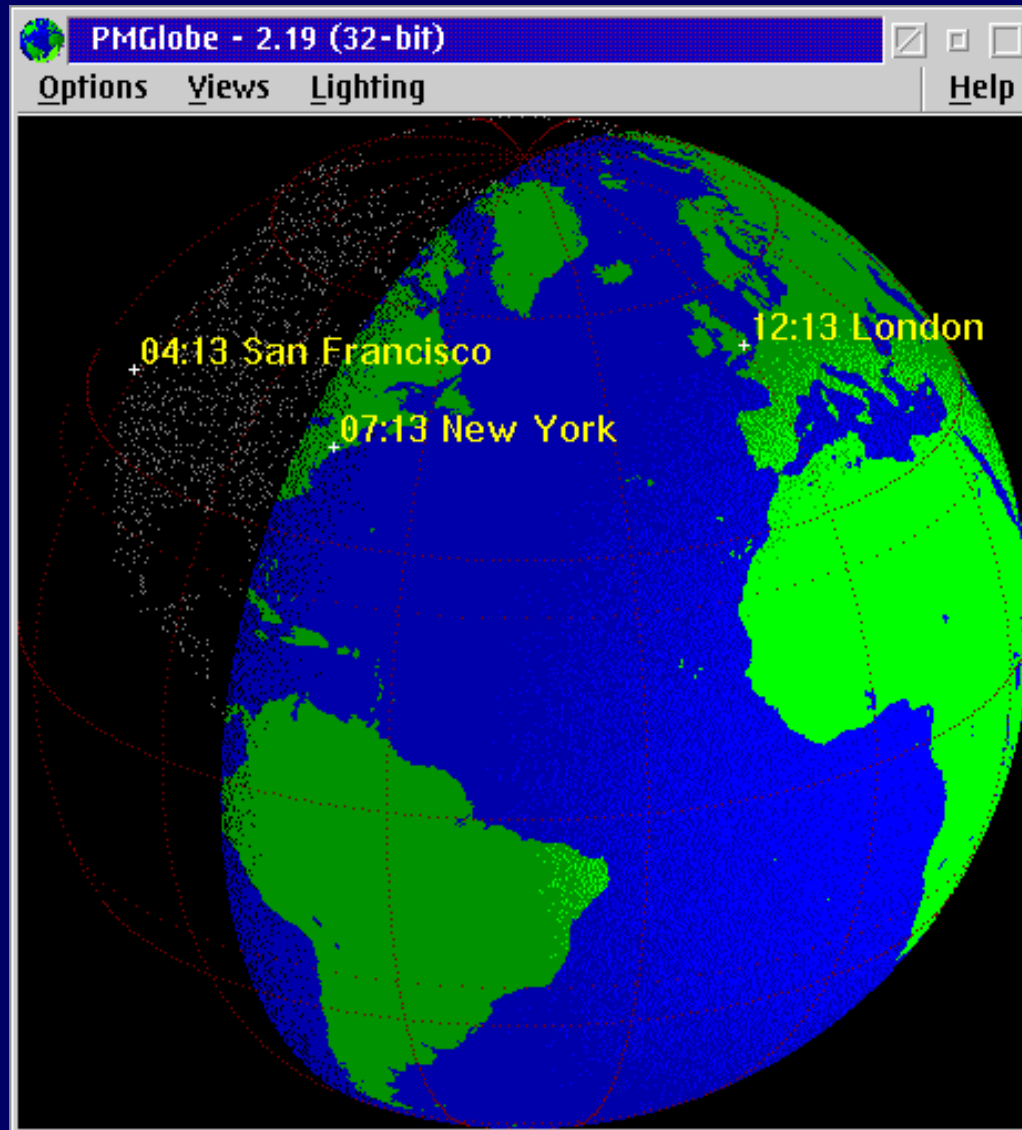
1988 – 1989

- Object REXX (Oryx) started by Simon Nash and team in Winchester (1988)
 - IBM Endicott involvement (from 1989)
 - (Eventually shipped in 1996)
- IBM Corporate Award (\$90,000) for Rexx (1988)
- REXX Compiler for VM/CMS shipped from Vienna (1989, also MVS later)

1990 – 1994

- First Rexx Symposium organized by Cathy Dager *et al* at SLAC (17 May 1990)
- 20+ Rexx books published 1990–1994 (including *The Rexx Language*, 2nd Ed.)
- SLAC has over 5,000,000 lines of Rexx
- MFC writes PMGlobe and GoServe ... customized by Rexx

PMGlobe then ...



... and now



1995: All change

- New IBM Strategy for languages ...
... Smalltalk
- Rexx development moved from Endicott to Böblingen (Germany)
- ... yet Java was on the horizon ...

1995 – 1999

- MFC ports Java to OS/2 (1995), then bootstraps NetRexx with Rexx (1996/7)
- 14 more Rexx books published
- ANSI Rexx (X3.274-1996) published
- Object REXX ships for OS/2, Windows, Linux, and AIX

2000 – 2009

- NetRexx interpreter in 2000–2001
- Making Rexx arithmetic “mainstream” in Java, hardware, XML, C, C++, banks, and in IEEE Floating Point Standard 754-2008
- Object Rexx transferred to RexxLA (2004)
- 50th Rexx book published (Rexx Programmer's Reference – Howard Fosdick – 2005)

2010 – 2019

- NetRexx transferred to RexxLA (2011)
- IEEE 754-2019 (revision started 2015)
- Open Object Rexx (ooRexx) and NetRexx continue to improve
- RexxLA also now manages the Regina interpreter (classic ANSI Rexx) and BSF4ooRexx (Java binding)

Rexx publications

- 51 Rexx books
- 68 manuals and guides (mostly IBM)
- Many articles and papers

For details, see:

<http://speleotrove.com/rexxhist/rexxbook.html>

Rexx implementations

- Runs on dozens of operating systems
VM ... Unix ... Linux ... DOS ... Windows ...
Android ... Lego Mindstorms ...
- 18 IBM products/implementations
- 9 other commercial implementations

For details, see:

<http://speleotrove.com/rexxhist/rexxplat.html>

Rexx resources

- More history, background information, early programs, documentation, *etc.* at: <http://speleotrove.com/rexxhist/>
- Some sample Rexx programs: http://speleotrove.com/rexx/Rexx_code.html
- And, of course, The Rexx Language Association website: <http://rexsla.org/>

Rexx impact ...

- Decimal arithmetic and other Rexx features are increasingly common (in C 202x, Lua, Python, Ruby, and many others)
- Rexx style, goals, and achievements are as important now as they were in 1979
 - readability, simplicity, portability, valuing people time, decimal arithmetic ...
 - and everyone here has contributed to that!

Questions?

Backup slides...

Why SIGNAL?

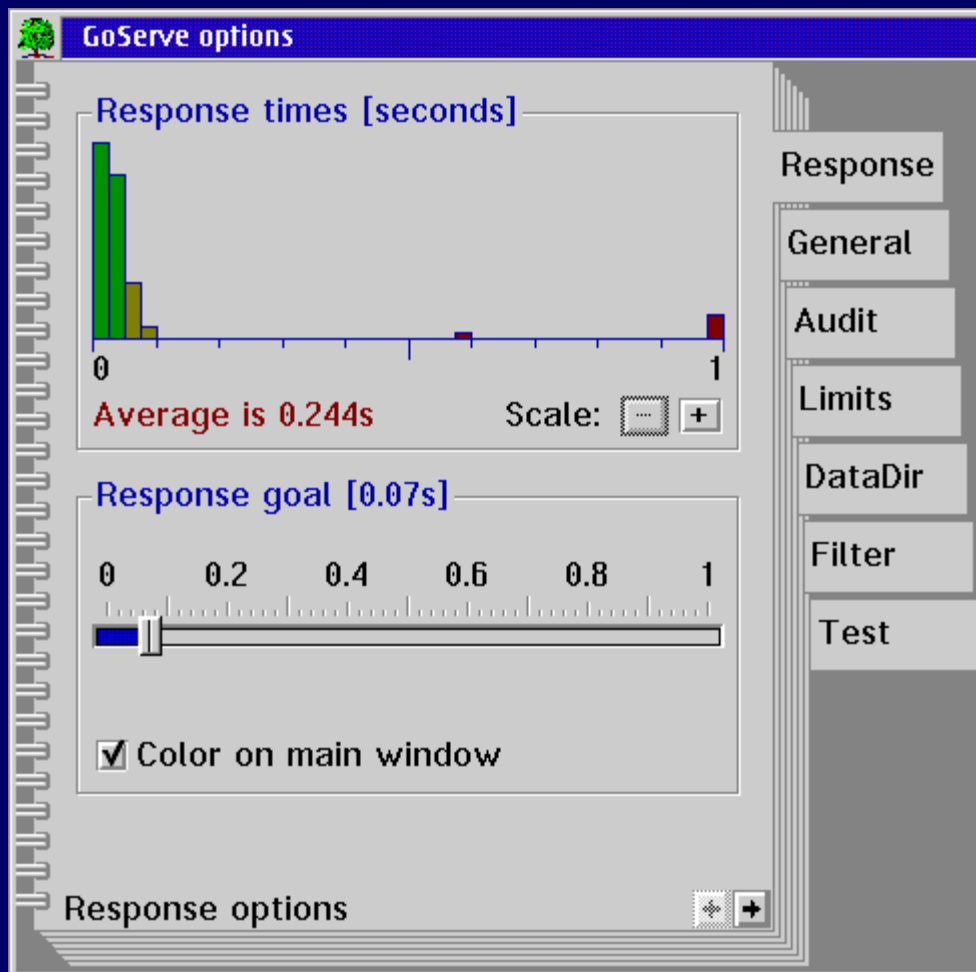
- Early addition to Rex (1979)
- Intended as an exception mechanism (quit from deeply nested programs)
 - but there was no way to propagate it up through CMS calling mechanism (SVC 202)
 - NetRexx uses Java exception mechanism, which works just as originally intended:

```
signal NumberFormatException
```


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 ‘)’

GoServe response time graph



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

... more ...

- 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:

```
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()**)