40 years of Rexx
— a personal view

Hursley

23 September 2019

Mike Cowlishaw

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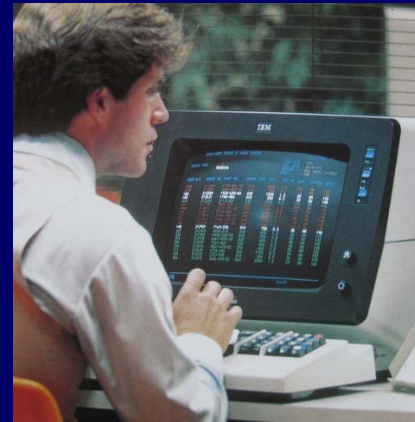
… and on 28 September 2019 we'll be celebrating those early days at the school!

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 …
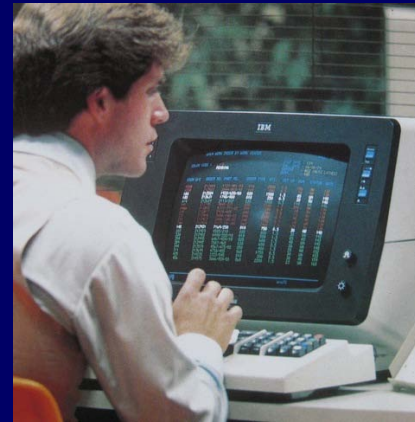

The team (December 1978)
(Ron Bowater, Doug Buttimer, Dave Milward, MFC)

Then … (1974-1979)

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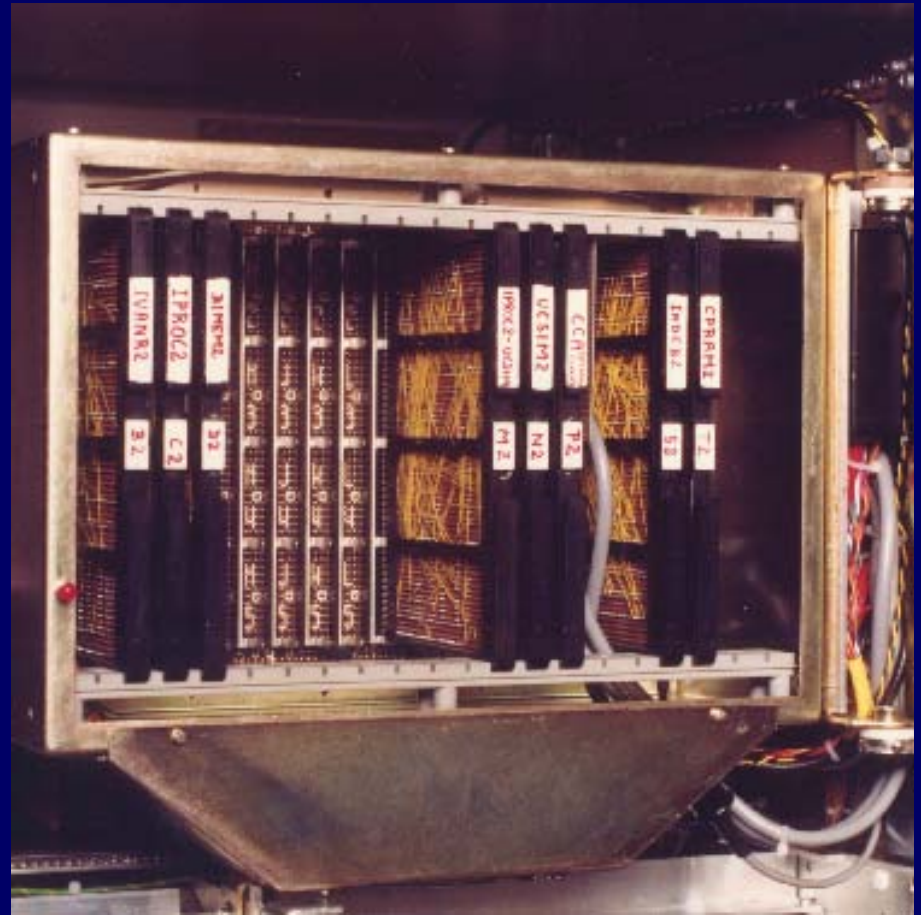 – building hardware for testing terminals such as the 3279 …

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)

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.*)
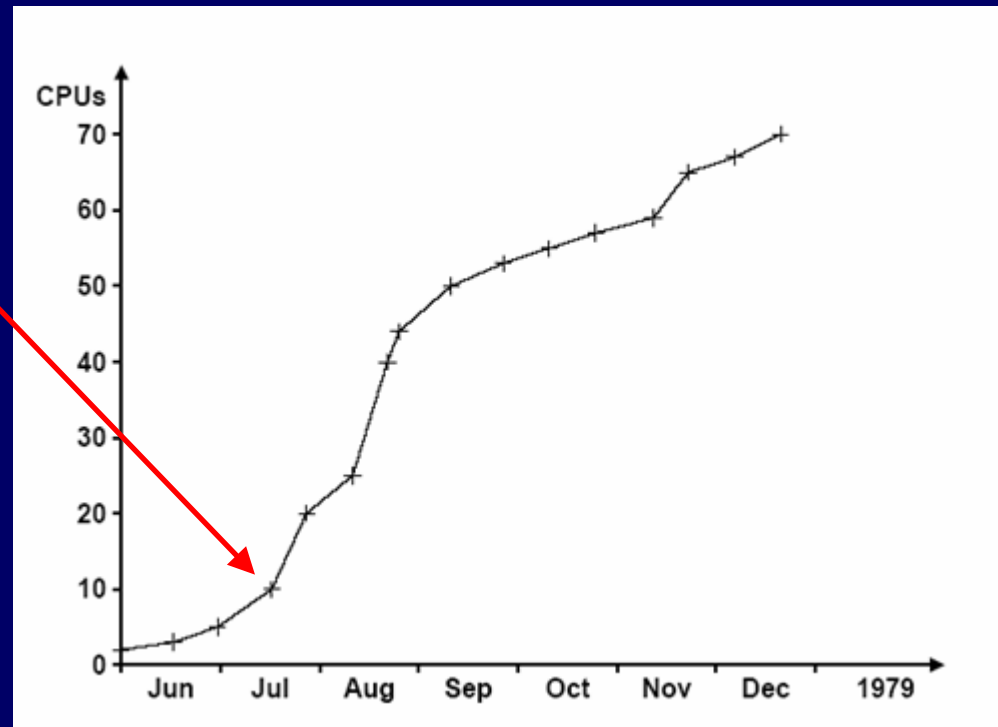 - hooks for vanilla CMS by Michel Hack

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)

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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

…..   < 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
<qtxt>He is euen but a very bungler. </qtxt></quot><quot><qdat>1642
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<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. </wk>II. 326 <qtxt>A bungler at all..sports that
required..patience or adroitness. </qtxt></quot><quot><qdat>1858
</qdat><auth>Hawthorne </auth><wk>Fr. & It. Jrnls. </wk>I. 292 <qtxt>The
greatest bungler that ever botched a block of marble. </qtxt></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 <qtxt>That Painter..having bungler-like drawn..some Cockes.
</qtxt></quot><quot><qdat>1613 </qdat><auth>Cotgr.,
</auth><qtxt><I>Rudement</I>..ruggedly, harshly, bunglarlike.
</qtxt></quot></entry>
```

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

One who bungles; a clumsy unskilful worker.
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            </qtxt></quot>
    <quot>
      <qdat>1858 </qdat>
```

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.*

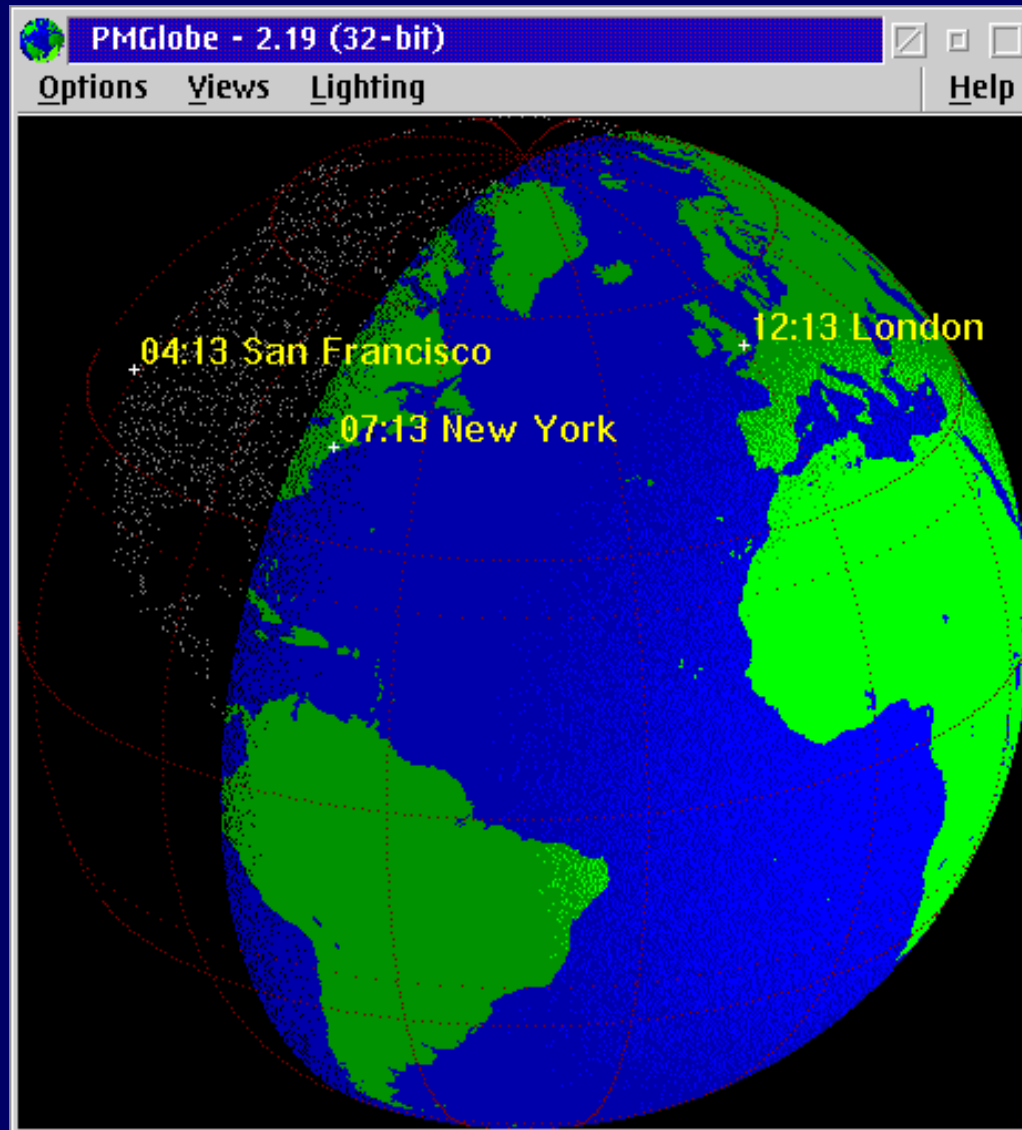- Major disagreement over Rexx in OS/2

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

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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://rexxla.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!

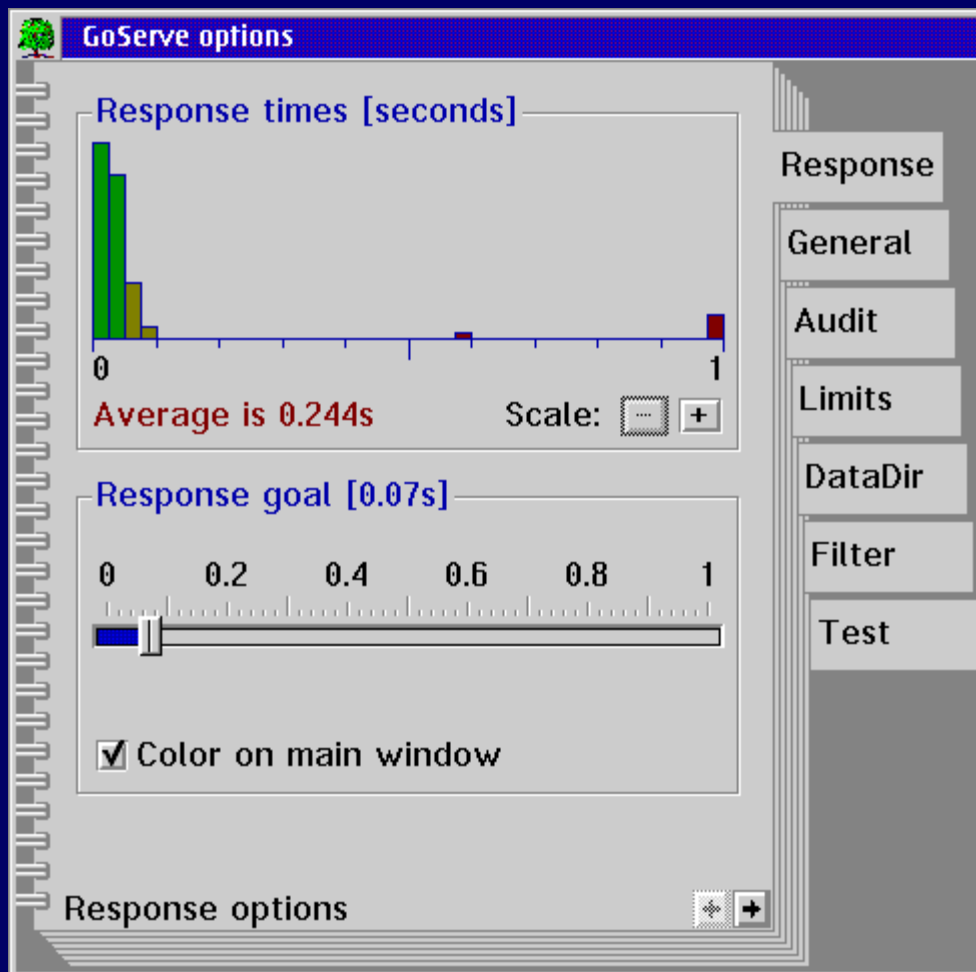# Questions?

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()`)