

Discovering Eastern European PCs by hacking them. Today

A blurred screenshot of a terminal window. The text visible in the terminal is: '?A', '0', 'READY.', and a solid black square cursor. The background of the terminal is a light gray with a subtle grid pattern.

?A
0
READY.
■

*Histories of Computing in Eastern Europe – HCEE 2018
Working Group 9.7 Workshop, IFIP World Congress
Poznań, 19 – 21 September 2018*

- Hackers in PC history & hacking for history
- The galaxy of Eastern European PCs
- A very BASIC question
- Today's hacking tools
- Few interesting findings



hackers in PC history & hacking for history





hacker, the original meaning

*a person who delights in having
an intimate understanding
of the internal workings of a system,
computers and computer networks in particular*

(RFC 1392 Internet Users' Glossary)

- The PC era begun in the late '70s
 - Computer enthusiasts, very committed hobbyists
 - Hardware: in the beginning there were the *Altair builders*
 - Software: stretching the home computers

- In the East European countries
 - To a lesser extent and few years later
 - Do It Yourself projects
 - Clones, often handmade

- An intimate understanding...
 - of historical facts...
 - obtained by deep investigation of technologies
 - Actually, all rebuilders are hackers – it's a compliment!
- HMR has hacking as a preferred method
 - Hacking the Macchina Ridotta – 1st computer built in Italy
 - Before HMR, the MR was believed a part of the (ex) 1st one
 - For HCEE we hacked Eastern European PC's



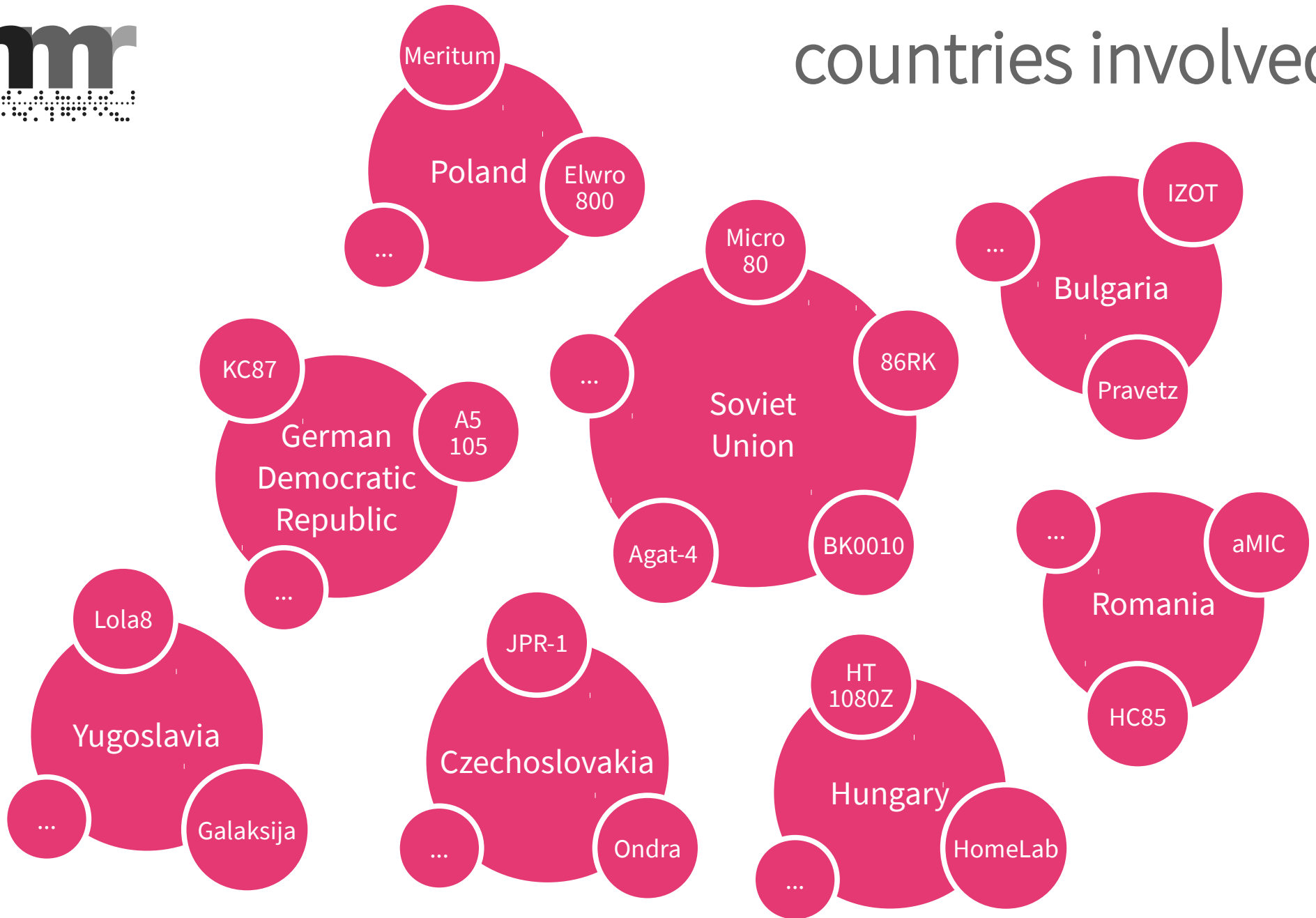
the galaxy of Eastern European PCs

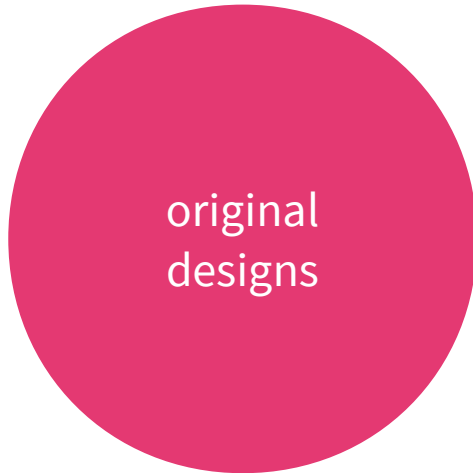


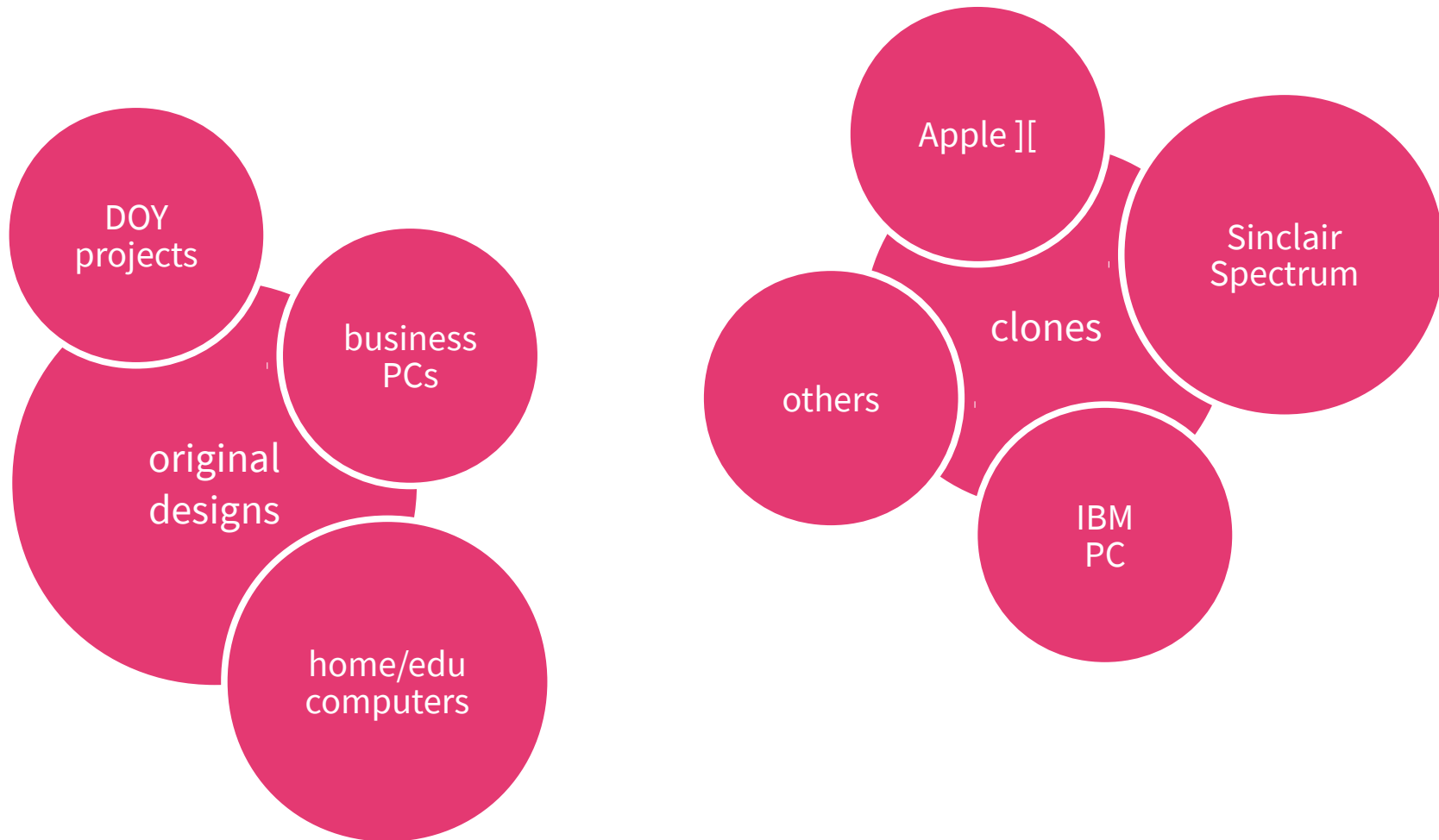
countries involved

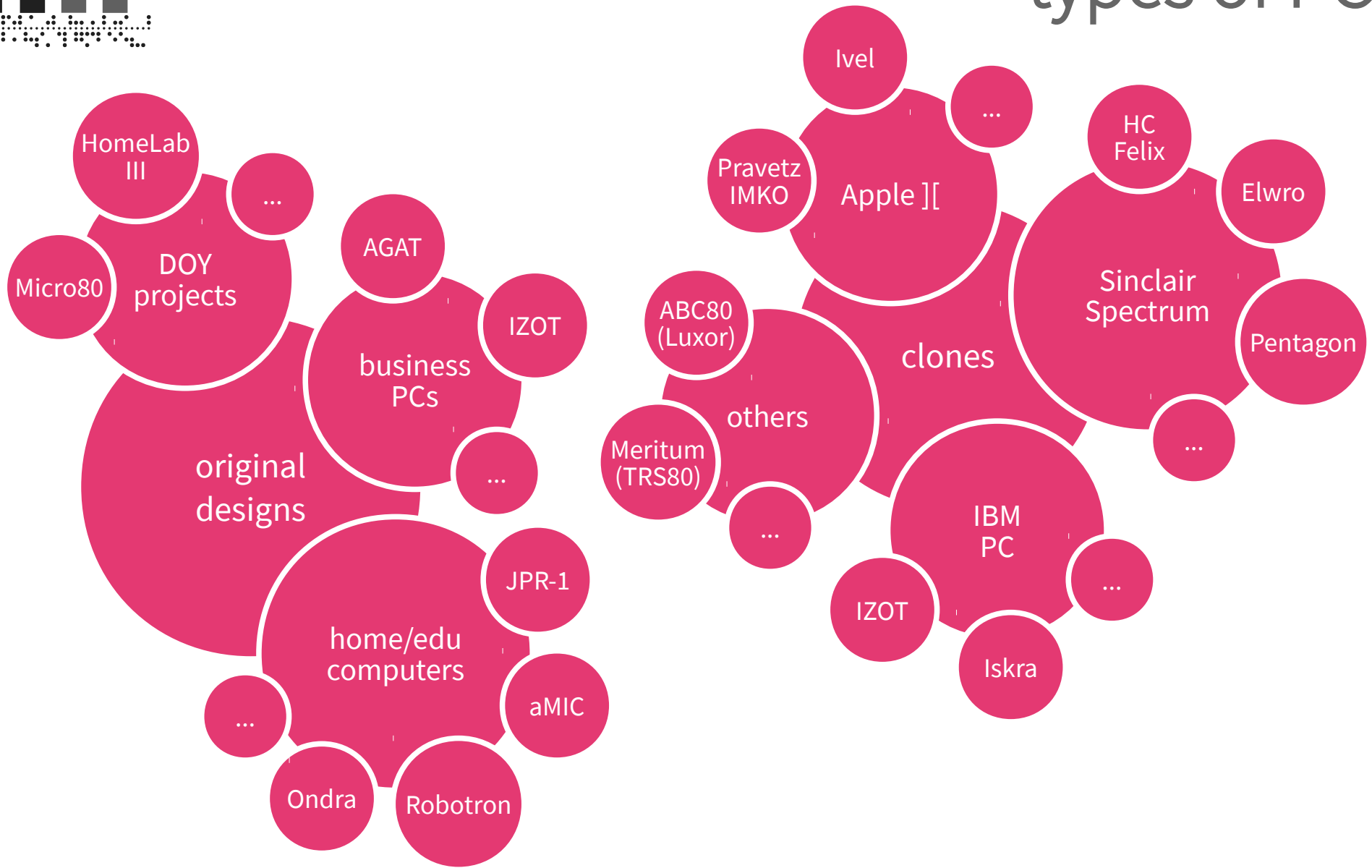


countries involved

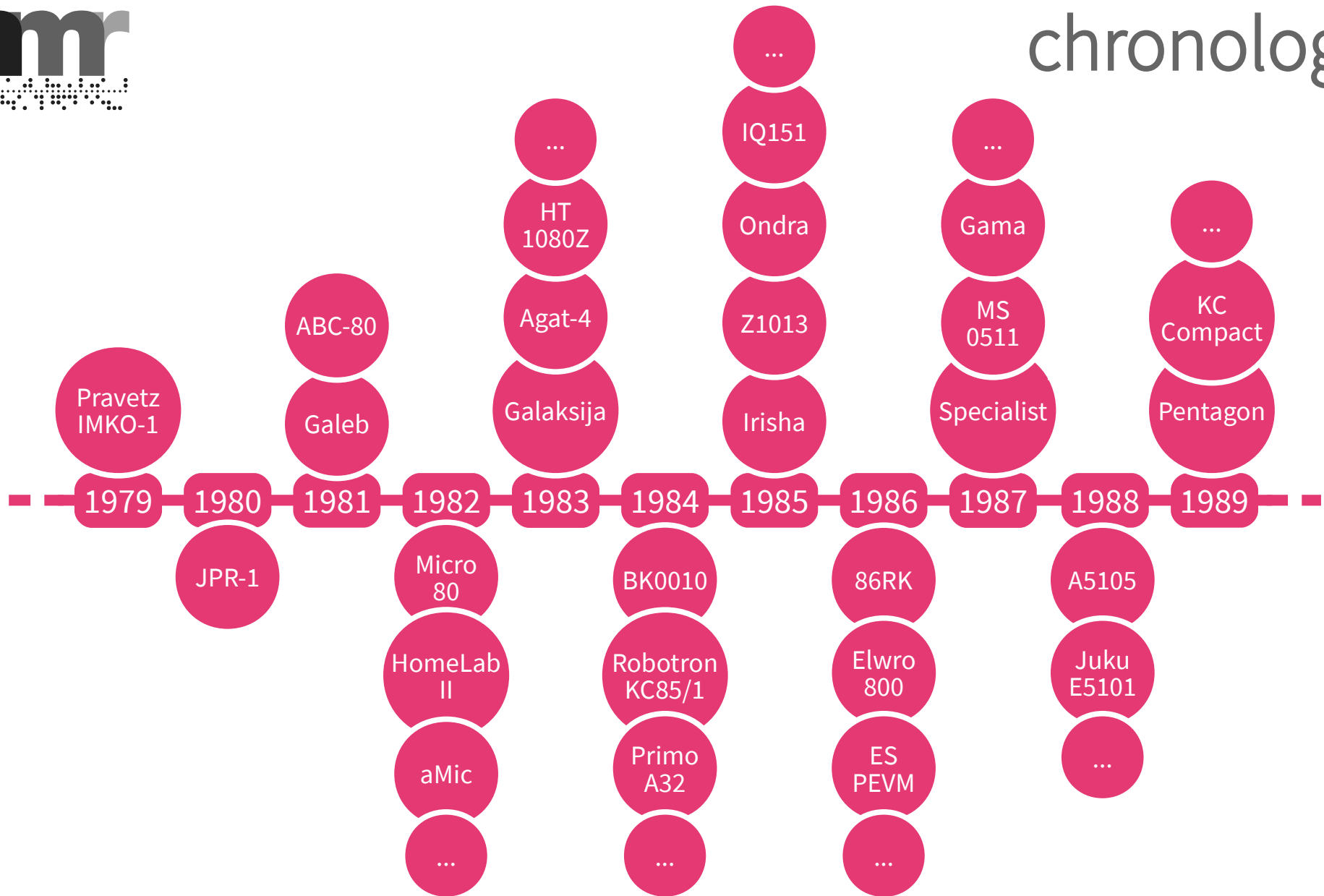














a very BASIC question

- Developed in 1964 at the Dartmouth College
- Despite critics, a huge success in the PC era
- Lots of versions, variants and derivatives
 - Altair/MS BASIC, BBC Basic, Sinclair BASIC, HuBasic...
 - And, of course, clones!
- Are the BASICs of Eastern European PCs original?

- Type “?A + enter” at start-up
- If the result is 0, the BASIC is Microsoft
 - “?” is a MS BASIC shortcut for “PRINT”
 - MS BASIC initializes all variables to 0
- Not very *hacker*
 - Actually, it just indicates good MS BASIC compatibility
 - We can do better, by using appropriate tools



today's hacking tools



- Reproducing the behaviour of a given system
 - At a specified interface level (machine language)
 - To run (experiment with) legacy 8-bit binaries
- Notable examples
 - *MAME*, initially targeted to arcade machines, now a generic emulation framework
 - *JKCEMU*, East German systems (Robotron)
 - *Oricutron*, Bulgarian Pravetz 8D (Oric clone)
 - *Fuse*, Spectrum & clones (Pentagon and ZS Scorpion)

- Assembly & ANSI C + modern PCs and optimizers
 - Carefully written C can be very fast – and it is portable
- Z88DK, evolution of Small-C for the Cambridge Z88
 - More than 70 Z80 architectures, 2 C compilers, libraries...
- CC65, evolution of Small-C for Atari 8-bit computers
 - About 20 6502 architectures, libraries
- SDCC (Z80 and others), CMOC (6809), ACK (8080)...

- Raise the bar
- A universal framework for 8-bit architectures
 - *CrossLib*, provides hardware abstraction for I/O
 - *CrossChase*, an action game to demonstrate CrossLib
 - The game compiles for nearly all 8-bit architectures
 - Including the Robotron and the Galaksija series
- An example to assess the maturity of the tools

- A tool for our question
 - While not meant for, BASCK helps in detecting derivatives of Sinclair, Microsoft or Hudson BASICs
- Part of the Z88DK
 - Scans ROMs to detect the entry points of BASIC routines
 - To call them directly
 - To make them available through a C library
 - Based on search for known code patterns

- Exadecimal addresses of found routines and data

```
...  
STAKFP  = $09A4    ; Put FP value on stack  
NEGAFT  = $13E2    ; Negate number  
LOG      = $0809    ; LOG  
SQR      = $13E7    ; SQR  
POWER   = $13F2    ; POWER  
EXP      = $1439    ; EXP  
COS      = $1541    ; COS
```

```
...  
# TOKEN table position = $1650  
# -- STATEMENTS --  
$1DAE - [128] END  
$1CA1 - [129] FOR  
$05E8 - [130] RESET  
$05DF - [131] SET  
...
```



few interesting findings

the obvious and the originals

- No surprises
 - All Spectrum clones use Sinclair BASIC
 - Many original hw designs use (portions of) MS BASIC
- East German Robotron series is quite interesting
 - KC85/1 and KC87 ('84) use MS BASIC...
 - ... but the Robotron Z1013 ('85) seems original
- The Yugoslav Galaksija ('83) series has original BASIC

- Hungarian *Primo*, by Microkey, introduced in 1984
 - A-16, A-32, A-64, B-64... based on U880 German Z80
 - BASIC developed by SZTAKI research institute (see [here](#))
- However, BASCK says:

```
# File size: 16384
```

```
# Specific Z80 CPU code detected
```

```
# Microsoft 8080/Z80 BASIC found
```

```
# Extended syntax detected (classic version)
```

```
# Double precision maths detected
```

```
# Microsoft signature not found
```

```
...
```



conclusions



- 8-bit Eastern European PCs, a galaxy to be explored
- A sort of continuity is in place
 - Yesterday's hobbyists, today's retrocomputing enthusiasts
 - They are outside the “official community of historians”...
 - ... yet they maintain a valuable amount of information
- Moreover, they provide hacking tools
 - Useful to check facts and claims by going deep to the bits