

SYNERGY DEVPARTNER CONFERENCE 2026

HICO: Modify Your ISAM Files Without Taking Down Your Application

Tate Chamberlain, Software Engineer

What's New with ISAM?

- Rev 6.5, not Rev 7
- New features
  - HC HICO? HIGHCO? High-Cooperative? HIGH_COOPERATIVE? Harmony Core?
  - "ISAM Plasticity"
  - "Non-qualified" duplicate keys
  - NOINDEX keys

What Can HICO Files Do?

High-cooperative files allow you to modify the basic details of a file while it's in use:

- Convert to HC (adding compression, if necessary)
- Extend record length
- Add a key
- Remove a key

The goal is to minimize application downtime, so that existing data files can be brought up to speed with the vision for your application without a huge outage window.

ISAM File Headers

Read/Write Metadata

- Number of active records
- Number of free segments (deleted records)
- Number of buckets in use
- Index depth
- Index offset
- Revision count
- Etc.

Read-Only Metadata

- Number of keys
- Key definitions
- Record length
- ISAM revision
- Page size
- Compression enabled/disabled
- Variable or fixed data segments
- Etc.

HC files involve treating some “read-only” metadata as read/write. The runtime can adapt to metadata changes, but programs require code changes to continue working during changes to keys and record length.

Example Procedure:
Adding a Key in Extended Record Space

Patch File
(Application down due to exclusive access)

isutl -p -qfile=hc customers.ism

Rebuild Application

- Update Repository
- Update file I/O to use a different size buffer based on current record size
- Check for new key before using it

Deploy Application
(Application down)

Finish Updating File

hcutl -c customers.ism (if necessary)
hcutl -e 78 customers.ism
hcutl -ka k=2,s=71,l=8,type=t customers

Example Code Changes

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Before

```
; SIZE(customer)==70
store(fch, customer)
```

```
; N/A
```

After

```
; SIZE(customer)==78
reclen = %isinfo(fch, "SIZE")
store(fch, customer(1:reclen))
```

```
if (%isinfo(fch,"NUMKEYS")==3)
begin
  … ; read by key 3 may fail
    ; if -ka isn’t finished
end
```

Live Demo

```
List all customer records by modify date.
    '00001 Samuel          Pickwick        pickwick@pickwick.club              2026-10-16 08:17:38'
    '00002 Nathaniel       Winkle          spotrsman@pickwick.club             2026-10-16 08:17:38'
    '00003 Augustus        Snodgrass       poet@pickwick.club                  2026-10-16 08:17:38'
    '00004 Sam             Weller          sam.veller@pickwick.club            2026-10-16 08:17:38'
    '00005 Tony            Weller          beware.of.vidders@marquisgranby.com 2026-10-16 08:17:38'
    '00006 Alfred          Jingle          capt.fitzmarshall@strollers.net     2026-10-16 08:17:38'
    '00007 Martha          Bardell         bardell@dodsonandfogg.co.uk         2026-10-16 08:17:38'
    '00008 Charles         Cheeryble       charles@cheerybles.co.uk            2026-10-16 08:17:38'
    '00010 Edward          Cuttle          when.found@woodenmidshipman.com     2026-10-16 08:17:38'
    '00011 Tom             Pinch           tom.pinch@pecksniff.com             2026-10-16 08:17:38'
    '00012 Tom             Traddles        t.traddles@grays-inn.co.uk          2026-10-16 08:17:38'
    '02778 Esther          Summerson       esther@bleak.house                  2026-10-16 08:25:08'

[customers.ism]  record length: 78  (program expects 78)  keys: 4
Current customer record:
    '02778 Esther          Summerson       esther@bleak.house                  2026-10-16 08:25:08'

Please make a selection:
1. Enter new customer record.
2. Select customer record by ID (holds lock).
3. Update current customer record.
4. Delete current customer record.
5. List all customer records by ID.
6. List all customer records by last name.
7. List all customer records by first name.
8. List all customer records by modify date.
0. Exit program.
```

isutl vs. hcutl

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Operation	isutl (exclusive access)	hcutl (cooperative)
Patch to HC	isutl -p -qfile=hc	N/A
Convert patched file to HC	isutl -ro isutl -p -qfile=hc,convert	hcutl -c
Check HC file status	N/A (though you could use ipar)	hcutl -i
Extend record length	N/A	hcutl -e 78
Add a key with no duplicates	isutl -ka k=2,s=11,l=5,nodups	hcutl -ka k=2,s=11,l=5,nodups
Add a key with normal (qualified) duplicates	isutl -ka k=2,s=11,l=5,dups	N/A
Add a key with non-qualified duplicates	isutl -ka k=2,s=11,l=5,dups=noqual	hcutl -ka k=2,s=11,l=5,dups=noqual
Delete the last key in the file	isutl -kd k=2,s=11,l=5	hcutl -kd k=2,s=11,l=5
Delete an arbitrary key (other than the first)	N/A	N/A (for now…)
Replace arbitrary deleted key	N/A	N/A (for now…)

Risks and Limitations

- High-cooperative files are a new feature. While we've tested them extensively, there might still be a bug or two (especially in edge cases).
  - Back up data before making changes
    - Consider using synbackup to pause I/O
  - Keep an eye out for bug fixes, especially for hcutl

Risks and Limitations

- Applications must still be updated to take advantage of file changes.
  - Store and write operations can fail if the program uses a larger record size than the actual file
  - Read operations can fail if the program uses a smaller record size than the actual file
  - Key-based operations can fail if program isn’t aware of a new key
  - Update your program before extending a record so it can handle both sizes.
  - Call %ISINFO or equivalent in your program before file I/O, which will update the internal representation of the file

Risks and Limitations

- Not all options in hcutl are available in isutl, or vice versa.
  - hcutl requires HC files
  - hcutl cannot add qualified duplicate keys
  - isutl cannot currently extend record length
  - Neither hcutl nor isutl can currently delete or replace arbitrary keys
  - isutl operations (especially -ka) can be faster than equivalent hcutl operations but require exclusive access to the file

Risks and Limitations

- Some existing ISAM files can’t be converted to HC.
  - Change-tracking is incompatible
  - Files with variable-length records are incompatible
  - Files with a page size < 4096 can’t use deferred conversion with hcutl, though they can be directly converted to HC with isutl
- Long-held record locks can prevent high-cooperative operations from finishing (hcutl -ka, and potentially hcutl -c).
  - If so, the error message should tell you how to resume once the lock is released

Additional Resources

synergex.com/docs/#tools/toolsChap3Highcooperativeisamfiles.htm

synergex.com/blog/2026/05/12/introducing-high-cooperative-files/

Questions?