

new/usr/src/cmd/stat/Makefile

1

```
*****
1267 Thu Jan 24 11:08:37 2013
new/usr/src/cmd/stat/Makefile
749 "/usr/bin/kstat" should be rewritten in C
Reviewed by: Garrett D'Amore <garrett@damore.org>
Reviewed by: Brendan Gregg <brendan.gregg@joyent.com>
*****
```

```
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24 #
25 #ident "%Z%M% %I% %E% SMI"
26 #
25 # cmd/stat/Makefile
26 #

28 include ../Makefile.cmd

30 SUBDIRS= iostat mpstat vmstat fsstat kstat
32 SUBDIRS= iostat mpstat vmstat fsstat

32 all := TARGET = all
33 install := TARGET = install
34 clean := TARGET = clean
35 clobber := TARGET = clobber
36 lint := TARGET = lint
37 _msg := TARGET = _msg

39 .KEEP_STATE:

41 all install lint clean clobber _msg: $(SUBDIRS)

43 $(SUBDIRS): FRC
44 @cd $@; pwd; $(MAKE) $(MFLAGS) $(TARGET)

46 FRC:
```

```
*****
1613 Thu Jan 24 11:08:37 2013
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Reviewed by: Garrett D'Amore <garrett@damore.org>
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```

```
26 PROG = kstat
27 OBJS = kstat.o
28 SRCS =$(OBJS:%.o=%.c) $(COMMON_SRCS)
```

```
30 include $(SRC)/cmd/Makefile.cmd
31 include $(SRC)/cmd/stat/Makefile.stat
```

```
33 LDLIBS += -lavl -lcmdutils -ldevinfo -lgen -lkstat
34 CFLAGS += $(CCVERBOSE) -I${STATCOMMONDIR}
35 CERRWARN += _gcc=-Wno-uninitialized
36 CERRWARN += _gcc=-Wno-switch
37 CERRWARN += _gcc=-Wno-parentheses
38 FILEMODE= 0555
```

```
40 lint := LINTFLAGS = -muxs -I${STATCOMMONDIR}
```

```
42 .KEEP_STATE:
```

```
44 all: $(PROG)
```

```
46 install: all $(ROOTPROG)
```

```
48 $(PROG): $(OBJS) $(COMMON_OBJS)
49     $(LINK.c) -o $(PROG) $(OBJS) $(COMMON_OBJS) $(LDLIBS)
50     $(POST_PROCESS)
```

```
52 %.o : $(STATCOMMONDIR)/%.c
53     $(COMPILE.c) -o $@ $<
54     $(POST_PROCESS_O)
```

```
56 clean:
57     -$(RM) $(OBJS) $(COMMON_OBJS)
```

```
59 lint: lint_SRCS
```

```
61 include $(SRC)/cmd/Makefile.targ
62 #endif /* ! codereview */
```

```

*****
36691 Thu Jan 24 11:08:37 2013
new/usr/src/cmd/stat/kstat/kstat.c
749 "/usr/bin/kstat" should be rewritten in C
Reviewed by: Garrett D'Amore <garrett@damore.org>
Reviewed by: Brendan Gregg <brendan.gregg@joyent.com>
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21
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24  * Copyright (c) 2013 David Hoepfner. All rights reserved.
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26 */
27
28 /*
29  * Display kernel statistics
30  *
31  * This is a reimplementaion of the perl kstat command originally found
32  * under usr/src/cmd/kstat/kstat.pl
33  *
34  * Incompatibilities:
35  *   - perl regular expressions replaced with extended REs bracketed by '/'
36  *   - options checking is stricter
37  *
38  * Flags added:
39  *   -C similar to the -p option but value is separated by a colon
40  *   -h display help
41  *   -j json format
42 */
43
44 #include <assert.h>
45 #include <ctype.h>
46 #include <errno.h>
47 #include <kstat.h>
48 #include <langinfo.h>
49 #include <libgen.h>
50 #include <limits.h>
51 #include <locale.h>
52 #include <signal.h>
53 #include <stddef.h>
54 #include <stdio.h>
55 #include <stdlib.h>
56 #include <string.h>
57 #include <strings.h>
58 #include <time.h>
59 #include <unistd.h>

```

```

60 #include <sys/list.h>
61 #include <sys/time.h>
62 #include <sys/types.h>
63
64 #include "kstat.h"
65 #include "statcommon.h"
66
67 char *cmdname = "kstat"; /* Name of this command */
68 int caught_cont = 0; /* Have caught a SIGCONT */
69
70 static uint_t g_timestamp_fmt = NODATE;
71
72 /* Helper flag - header was printed already? */
73 static boolean_t g_headerflg;
74
75 /* Saved command line options */
76 static boolean_t g_cflg = B_FALSE;
77 static boolean_t g_jflg = B_FALSE;
78 static boolean_t g_lflg = B_FALSE;
79 static boolean_t g_pflg = B_FALSE;
80 static boolean_t g_qflg = B_FALSE;
81 static ks_pattern_t g_ks_class = {"*", 0};
82
83 /* Return zero if a selector did match */
84 static int g_matched = 1;
85
86 /* Sorted list of kstat instances */
87 static list_t instances_list;
88 static list_t selector_list;
89
90 int
91 main(int argc, char **argv)
92 {
93     ks_selector_t *nselector;
94     ks_selector_t *uselector;
95     kstat_ctl_t *kc;
96     hrtime_t start_n;
97     hrtime_t period_n;
98     boolean_t errflg = B_FALSE;
99     boolean_t nselflg = B_FALSE;
100    boolean_t uselflg = B_FALSE;
101    char *q;
102    int count = 1;
103    int infinite_cycles = 0;
104    int interval = 0;
105    int n = 0;
106    int c, m, tmp;
107
108    (void) setlocale(LC_ALL, "");
109    #if !defined(TEXT_DOMAIN) /* Should be defined by cc -D */
110    #define TEXT_DOMAIN "SYS_TEST" /* Use this only if it wasn't */
111    #endif
112    (void) textdomain(TEXT_DOMAIN);
113
114    /*
115     * Create the selector list and a dummy default selector to match
116     * everything. While we process the cmdline options we will add
117     * selectors to this list.
118     */
119    list_create(&selector_list, sizeof(ks_selector_t),
120              offsetof(ks_selector_t, ks_next));
121
122    nselector = new_selector();
123
124    /*
125     * Parse named command line arguments.

```



```

258         if (m < 4) {
259             free(useselector);
260             usage();
261             exit(2);
262         }
263
264         useselfg = B_TRUE;
265         list_insert_tail(&selector_list, useselector);
266     } else {
267         if (tmp < 1) {
268             if (n == 0) {
269                 (void) fprintf(stderr, gettext(
270                     "Interval must be an "
271                     "integer >= 1"));
272             } else if (n == 1) {
273                 (void) fprintf(stderr, gettext(
274                     "Count must be an integer >= 1"));
275             }
276             usage();
277             exit(2);
278         } else {
279             if (n == 0) {
280                 interval = tmp;
281                 count = -1;
282             } else if (n == 1) {
283                 count = tmp;
284             } else {
285                 usage();
286                 exit(2);
287             }
288         }
289         n++;
290     }
291     argv++;
292 }
293
294 /*
295  * Check if we founded a named selector on the cmdline.
296  */
297 if (useselfg) {
298     if (nselflg) {
299         (void) fprintf(stderr, gettext(
300             "module:instance:name:statistic and "
301             "-m -i -n -s are mutually exclusive"));
302         usage();
303         exit(2);
304     } else {
305         free(nselector);
306     }
307 } else {
308     list_insert_tail(&selector_list, nselector);
309 }
310
311 assert(!list_is_empty(&selector_list));
312
313 list_create(&instances_list, sizeof (ks_instance_t),
314     offsetof(ks_instance_t, ks_next));
315
316 while ((kc = kstat_open()) == NULL) {
317     if (errno == EAGAIN) {
318         (void) poll(NULL, 0, 200);
319     } else {
320         perror("kstat_open");
321         exit(3);
322     }
323 }

```

```

325     if (count > 1) {
326         if (signal(SIGCONT, cont_handler) == SIG_ERR) {
327             (void) fprintf(stderr, gettext(
328                 "signal failed"));
329             exit(3);
330         }
331     }
332
333     period_n = (hrtime_t)interval * NANOSEC;
334     start_n = gethrtime();
335
336     while (count == -1 || count-- > 0) {
337         ks_instances_read(kc);
338         ks_instances_print();
339
340         if (interval && count) {
341             ks_sleep_until(&start_n, period_n, infinite_cycles,
342                 &caught_cont);
343             (void) kstat_chain_update(kc);
344             (void) putchar('\n');
345         }
346     }
347
348     (void) kstat_close(kc);
349
350     return (g_matched);
351 }
352
353 /*
354  * Print usage.
355  */
356 static void
357 usage(void)
358 {
359     (void) fprintf(stderr, gettext(
360         "Usage:\n"
361         "kstat [ -Cjlpq ] [ -T d|u ] [ -c class ]\n"
362         "          [ -m module ] [ -i instance ] [ -n name ] [ -s statistic ]\n"
363         "          [ interval [ count ] ]\n"
364         "kstat [ -Cjlpq ] [ -T d|u ] [ -c class ]\n"
365         "          [ module:instance:name:statistic ... ]\n"
366         "          [ interval [ count ] ]\n"));
367 }
368
369 /*
370  * Sort compare function.
371  */
372 static int
373 compare_instances(ks_instance_t *l_arg, ks_instance_t *r_arg)
374 {
375     int     rval;
376
377     rval = strcasecmp(l_arg->ks_module, r_arg->ks_module);
378     if (rval == 0) {
379         if (l_arg->ks_instance == r_arg->ks_instance) {
380             return (strcasecmp(l_arg->ks_name, r_arg->ks_name));
381         } else if (l_arg->ks_instance < r_arg->ks_instance) {
382             return (-1);
383         } else {
384             return (1);
385         }
386     } else {
387         return (rval);
388     }
389 }

```

```

391 static char *
392 ks_safe_strdup(char *str)
393 {
394     char    *ret;
395
396     if (str == NULL) {
397         return (NULL);
398     }
399
400     while ((ret = strdup(str)) == NULL) {
401         if (errno == EAGAIN) {
402             (void) poll(NULL, 0, 200);
403         } else {
404             perror("strdup");
405             exit(3);
406         }
407     }
408
409     return (ret);
410 }
411
412 static void
413 ks_sleep_until(hrtime_t *wakeup, hrtime_t interval, int forever,
414 int *caught_cont)
415 {
416     hrtime_t    now, pause, pause_left;
417     struct timespec pause_tv;
418     int         status;
419
420     now = gethrtime();
421     pause = *wakeup + interval - now;
422
423     if (pause <= 0 || pause < (interval / 4)) {
424         if (forever || *caught_cont) {
425             *wakeup = now + interval;
426             pause = interval;
427         } else {
428             pause = interval / 2;
429             *wakeup += interval;
430         }
431     } else {
432         *wakeup += interval;
433     }
434
435     if (pause < 1000) {
436         return;
437     }
438
439     pause_left = pause;
440     do {
441         pause_tv.tv_sec = pause_left / NANOSEC;
442         pause_tv.tv_nsec = pause_left % NANOSEC;
443         status = nanosleep(&pause_tv, (struct timespec *)NULL);
444         if (status < 0) {
445             if (errno == EINTR) {
446                 now = gethrtime();
447                 pause_left = *wakeup - now;
448                 if (pause_left < 1000) {
449                     return;
450                 }
451             } else {
452                 perror("nanosleep");
453                 exit(3);
454             }
455         }

```

```

456     } while (status != 0);
457 }
458
459 /*
460 * Inserts an instance in the per selector list.
461 */
462 static void
463 nvpair_insert(ks_instance_t *ksi, char *name, ks_value_t *value,
464 uchar_t data_type)
465 {
466     ks_nvpair_t    *instance;
467     ks_nvpair_t    *tmp;
468
469     instance = (ks_nvpair_t *)malloc(sizeof (ks_nvpair_t));
470     if (instance == NULL) {
471         perror("malloc");
472         exit(3);
473     }
474
475     (void) strncpy(instance->name, name, KSTAT_STRLEN);
476     (void) memcpy(&instance->value, value, sizeof (ks_value_t));
477     instance->data_type = data_type;
478
479     tmp = list_head(&ksi->ks_nvlist);
480     while (tmp != NULL && strcasecmp(instance->name, tmp->name) > 0)
481         tmp = list_next(&ksi->ks_nvlist, tmp);
482
483     list_insert_before(&ksi->ks_nvlist, tmp, instance);
484 }
485
486 /*
487 * Allocates a new all-matching selector.
488 */
489 static ks_selector_t *
490 new_selector(void)
491 {
492     ks_selector_t    *selector;
493
494     selector = (ks_selector_t *)malloc(sizeof (ks_selector_t));
495     if (selector == NULL) {
496         perror("malloc");
497         exit(3);
498     }
499
500     list_link_init(&selector->ks_next);
501
502     selector->ks_module.pstr = "";
503     selector->ks_instance.pstr = "";
504     selector->ks_name.pstr = "";
505     selector->ks_statistic.pstr = "";
506
507     return (selector);
508 }
509
510 /*
511 * This function was taken from the perl kstat module code - please
512 * see for further comments there.
513 */
514 static kstat_raw_reader_t
515 lookup_raw_kstat_fn(char *module, char *name)
516 {
517     char            key[KSTAT_STRLEN * 2];
518     register char   *f, *t;
519     int             n = 0;
520
521     for (f = module, t = key; *f != '\0'; f++, t++) {

```

```

522         while (*f != '\0' && isdigit(*f))
523             f++;
524         *t = *f;
525     }
526     *t++ = ':';

528     for (f = name; *f != '\0'; f++, t++) {
529         while (*f != '\0' && isdigit(*f))
530             f++;
531         *t = *f;
532     }
533     *t = '\0';

535     while (ks_raw_lookup[n].fn != NULL) {
536         if (strncmp(ks_raw_lookup[n].name, key, strlen(key)) == 0)
537             return (ks_raw_lookup[n].fn);
538         n++;
539     }

541     return (0);
542 }

544 /*
545  * Match a string against a shell glob or extended regular expression.
546  */
547 static boolean_t
548 ks_match(const char *str, ks_pattern_t *pattern)
549 {
550     int     regcode;
551     char   *regstr;
552     char   *errbuf;
553     size_t  bufosz;

555     if (pattern->pstr != NULL && gmatch(pattern->pstr, "/*/") != 0) {
556         /* All regex patterns are strdup'd copies */
557         regstr = pattern->pstr + 1;
558         *(strchr(regstr, '/')) = '\0';

560         regcode = regcomp(&pattern->preg, regstr,
561             REG_EXTENDED | REG_NOSUB);
562         if (regcode != 0) {
563             bufosz = regerror(regcode, NULL, NULL, 0);
564             if (bufosz != 0) {
565                 errbuf = malloc(bufosz);
566                 if (errbuf == NULL) {
567                     perror("malloc");
568                     exit(3);
569                 }
570                 (void) regerror(regcode, NULL, errbuf, bufosz);
571                 (void) fprintf(stderr, "kstat: %s\n", errbuf);
572             }
573             usage();
574             exit(2);
575         }

577         pattern->pstr = NULL;
578     }

580     if (pattern->pstr == NULL) {
581         return (regexec(&pattern->preg, str, 0, NULL, 0) == 0);
582     }

584     return ((gmatch(str, pattern->pstr) != 0));
585 }

587 /*

```

```

588  * Iterate over all kernel statistics and save matches.
589  */
590 static void
591 ks_instances_read(kstat_ctl_t *kc)
592 {
593     kstat_raw_reader_t save_raw = NULL;
594     kid_t             id;
595     ks_selector_t     *selector;
596     ks_instance_t     *ksi;
597     ks_instance_t     *tmp;
598     kstat_t           *kp;
599     boolean_t         skip;

601     for (kp = kc->kc_chain; kp != NULL; kp = kp->ks_next) {
602         /* Don't bother storing the kstat headers */
603         if (strncmp(kp->ks_name, "kstat_", 6) == 0) {
604             continue;
605         }

607         /* Don't bother storing raw stats we don't understand */
608         if (kp->ks_type == KSTAT_TYPE_RAW) {
609             save_raw = lookup_raw_kstat_fn(kp->ks_module,
610                 kp->ks_name);
611             if (save_raw == NULL) {
612                 #ifdef REPORT_UNKNOWN
613                     (void) fprintf(stderr,
614                         "Unknown kstat type %s:%d:%s -
615                         "%d of size %d\n", kp->ks_module,
616                         kp->ks_instance, kp->ks_name,
617                         kp->ks_ndata, kp->ks_data_size);
618                 #endif
619                 continue;
620             }
621         }

623         /*
624          * Iterate over the list of selectors and skip
625          * instances we dont want. We filter for statistics
626          * later, as we dont know them yet.
627          */
628         skip = B_TRUE;
629         selector = list_head(&selector_list);
630         while (selector != NULL) {
631             if (ks_match(kp->ks_module, &selector->ks_module) ||
632                 ks_match(kp->ks_name, &selector->ks_name)) {
633                 skip = B_FALSE;
634                 break;
635             }
636             selector = list_next(&selector_list, selector);
637         }

639         if (skip) {
640             continue;
641         }

643         /*
644          * Allocate a new instance and fill in the values
645          * we know so far.
646          */
647         ksi = (ks_instance_t *)malloc(sizeof(ks_instance_t));
648         if (ksi == NULL) {
649             perror("malloc");
650             exit(3);
651         }

653         list_link_init(&ksi->ks_next);

```

```

655     (void) strcpy(ksi->ks_module, kp->ks_module, KSTAT_STRLEN);
656     (void) strcpy(ksi->ks_name, kp->ks_name, KSTAT_STRLEN);
657     (void) strcpy(ksi->ks_class, kp->ks_class, KSTAT_STRLEN);

659     ksi->ks_instance = kp->ks_instance;
660     ksi->ks_snaptime = kp->ks_snaptime;
661     ksi->ks_type = kp->ks_type;

663     list_create(&ksi->ks_nvlist, sizeof (ks_nvpair_t),
664               offsetof(ks_nvpair_t, nv_next));

666     SAVE_HRTIME_X(ksi, "crttime", kp->ks_crttime);
667     SAVE_HRTIME_X(ksi, "snaptime", kp->ks_snaptime);
668     if (g_pflg) {
669         SAVE_STRING_X(ksi, "class", kp->ks_class);
670     }

672     /* Insert this instance into a sorted list */
673     tmp = list_head(&instances_list);
674     while (tmp != NULL && compare_instances(ksi, tmp) > 0)
675         tmp = list_next(&instances_list, tmp);

677     list_insert_before(&instances_list, tmp, ksi);

679     /* Read the actual statistics */
680     id = kstat_read(kc, kp, NULL);
681     if (id == -1) {
682 #ifdef REPORT_UNKNOWN
683         perror("kstat_read");
684 #endif
685         continue;
686     }

688     switch (kp->ks_type) {
689     case KSTAT_TYPE_RAW:
690         save_raw(kp, ksi);
691         break;
692     case KSTAT_TYPE_NAMED:
693         save_named(kp, ksi);
694         break;
695     case KSTAT_TYPE_INTR:
696         save_intr(kp, ksi);
697         break;
698     case KSTAT_TYPE_IO:
699         save_io(kp, ksi);
700         break;
701     case KSTAT_TYPE_TIMER:
702         save_timer(kp, ksi);
703         break;
704     default:
705         assert(B_FALSE); /* Invalid type */
706         break;
707     }
708 }
709 }

711 /*
712  * Print the value of a name-value pair.
713  */
714 static void
715 ks_value_print(ks_nvpair_t *nvpair)
716 {
717     switch (nvpair->data_type) {
718     case KSTAT_DATA_CHAR:
719         (void) fprintf(stdout, "%s", nvpair->value.c);

```

```

720         break;
721     case KSTAT_DATA_INT32:
722         (void) fprintf(stdout, "%d", nvpair->value.i32);
723         break;
724     case KSTAT_DATA_UINT32:
725         (void) fprintf(stdout, "%u", nvpair->value.ui32);
726         break;
727     case KSTAT_DATA_INT64:
728         (void) fprintf(stdout, "%lld", nvpair->value.i64);
729         break;
730     case KSTAT_DATA_UINT64:
731         (void) fprintf(stdout, "%llu", nvpair->value.ui64);
732         break;
733     case KSTAT_DATA_STRING:
734         (void) fprintf(stdout, "%s", KSTAT_NAMED_STR_PTR(nvpair));
735         break;
736     case KSTAT_DATA_HRTIME:
737         if (nvpair->value.ui64 == 0)
738             (void) fprintf(stdout, "0");
739         else
740             (void) fprintf(stdout, "%.9f",
741                             nvpair->value.ui64 / 1000000000.0);
742         break;
743     default:
744         assert(B_FALSE);
745     }
746 }

748 /*
749  * Print a single instance.
750  */
751 static void
752 ks_instance_print(ks_instance_t *ksi, ks_nvpair_t *nvpair)
753 {
754     if (g_headerflg) {
755         if (!g_pflg) {
756             (void) fprintf(stdout, DFLT_FMT,
757                             ksi->ks_module, ksi->ks_instance,
758                             ksi->ks_name, ksi->ks_class);
759         }
760         g_headerflg = B_FALSE;
761     }

763     if (g_pflg) {
764         (void) fprintf(stdout, KS_PFMT,
765                         ksi->ks_module, ksi->ks_instance,
766                         ksi->ks_name, nvpair->name);
767         if (!g_lflg) {
768             (void) putchar(g_cflg ? ':' : '\t');
769             ks_value_print(nvpair);
770         }
771     } else {
772         (void) fprintf(stdout, KS_DFMT, nvpair->name);
773         ks_value_print(nvpair);
774     }

776     (void) putchar('\n');
777 }

779 /*
780  * Print a single instance in JSON format.
781  */
782 static void
783 ks_instance_print_json(ks_instance_t *ksi, ks_nvpair_t *nvpair)
784 {
785     if (g_headerflg) {

```



```

786         (void) fprintf(stdout, JSON_FMT,
787             ksi->ks_module, ksi->ks_instance,
788             ksi->ks_name, ksi->ks_class,
789             ksi->ks_type);

791     if (ksi->ks_snaptime == 0)
792         (void) fprintf(stdout, "\t\"snaptime\": 0,\n");
793     else
794         (void) fprintf(stdout, "\t\"snaptime\": %.9f,\n",
795             ksi->ks_snaptime / 1000000000.0);

797     (void) fprintf(stdout, "\t\"data\": {\n");

799     g_headerflg = B_FALSE;
800 }

802 (void) fprintf(stdout, KS_JFMT, nvpair->name);
803 if (nvpair->data_type == KSTAT_DATA_STRING) {
804     (void) putchar('\n');
805     ks_value_print(nvpair);
806     (void) putchar('\n');
807 } else {
808     ks_value_print(nvpair);
809 }
810 if (nvpair != list_tail(&ksi->ks_nvlist))
811     (void) putchar(',');

813     (void) putchar('\n');
814 }

816 /*
817  * Print all instances.
818  */
819 static void
820 ks_instances_print(void)
821 {
822     ks_selector_t *selector;
823     ks_instance_t *ksi, *ktmp;
824     ks_nvpair_t *nvpair, *ntmp;
825     void (*ks_print_fn)(ks_instance_t *, ks_nvpair_t *);
826     char *ks_number;

828     if (g_timestamp_fmt != NODATE)
829         print_timestamp(g_timestamp_fmt);

831     if (g_jflg) {
832         ks_print_fn = &ks_instance_print_json;
833         (void) putchar('[');
834     } else {
835         ks_print_fn = &ks_instance_print;
836     }

838     /* Iterate over each selector */
839     selector = list_head(&selector_list);
840     while (selector != NULL) {

842         /* Iterate over each instance */
843         for (ksi = list_head(&instances_list); ksi != NULL;
844             ksi = list_next(&instances_list, ksi)) {

846             (void) asprintf(&ks_number, "%d", ksi->ks_instance);
847             if (!(ks_match(ksi->ks_module, &selector->ks_module) &&
848                 ks_match(ksi->ks_name, &selector->ks_name) &&
849                 ks_match(ks_number, &selector->ks_instance) &&
850                 ks_match(ksi->ks_class, &g_ks_class))) {
851                 free(ks_number);

```

```

852         continue;
853     }

855     free(ks_number);

857     /* Finally iterate over each statistic */
858     g_headerflg = B_TRUE;
859     for (nvpair = list_head(&ksi->ks_nvlist);
860         nvpair != NULL;
861         nvpair = list_next(&ksi->ks_nvlist, nvpair)) {
862         if (!ks_match(nvpair->name,
863             &selector->ks_statistic))
864             continue;

866         g_matched = 0;
867         if (!g_qflg)
868             (*ks_print_fn)(ksi, nvpair);
869     }

871     if (!g_headerflg) {
872         if (g_jflg) {
873             (void) fprintf(stdout, "\t}\n");
874             if (ksi != list_tail(&instances_list))
875                 (void) putchar(',');
876         } else if (!g_pflg) {
877             (void) putchar('\n');
878         }
879     }
880 }

882     selector = list_next(&selector_list, selector);
883 }

885     if (g_jflg)
886         (void) fprintf(stdout, "]\n");

888     (void) fflush(stdout);

890     /* Free the instances list */
891     ksi = list_head(&instances_list);
892     while (ksi != NULL) {
893         nvpair = list_head(&ksi->ks_nvlist);
894         while (nvpair != NULL) {
895             ntmp = nvpair;
896             nvpair = list_next(&ksi->ks_nvlist, nvpair);
897             list_remove(&ksi->ks_nvlist, ntmp);
898             if (ntmp->data_type == KSTAT_DATA_STRING)
899                 free(ntmp->value.str.addr.ptr);
900             free(ntmp);
901         }

903         ktmp = ksi;
904         ksi = list_next(&instances_list, ksi);
905         list_remove(&instances_list, ktmp);
906         list_destroy(&ktmp->ks_nvlist);
907         free(ktmp);
908     }
909 }

911 static void
912 save_cpu_stat(kstat_t *kp, ks_instance_t *ksi)
913 {
914     cpu_stat_t *stat;
915     cpu_sysinfo_t *sysinfo;
916     cpu_syswait_t *syswait;
917     cpu_vminfo_t *vminfo;

```

```

919     stat = (cpu_stat_t *) (kp->ks_data);
920     sysinfo = &stat->cpu_sysinfo;
921     syswait = &stat->cpu_syswait;
922     vminfo = &stat->cpu_vminfo;

924     SAVE_UINT32_X(ksi, "idle", sysinfo->cpu[CPU_IDLE]);
925     SAVE_UINT32_X(ksi, "user", sysinfo->cpu[CPU_USER]);
926     SAVE_UINT32_X(ksi, "kernel", sysinfo->cpu[CPU_KERNEL]);
927     SAVE_UINT32_X(ksi, "wait", sysinfo->cpu[CPU_WAIT]);
928     SAVE_UINT32_X(ksi, "wait_io", sysinfo->cpu[W_IO]);
929     SAVE_UINT32_X(ksi, "wait_swap", sysinfo->cpu[W_SWAP]);
930     SAVE_UINT32_X(ksi, "wait_pio", sysinfo->cpu[W_PIO]);
931     SAVE_UINT32(ksi, sysinfo, bread);
932     SAVE_UINT32(ksi, sysinfo, bwrite);
933     SAVE_UINT32(ksi, sysinfo, lread);
934     SAVE_UINT32(ksi, sysinfo, lwrite);
935     SAVE_UINT32(ksi, sysinfo, phread);
936     SAVE_UINT32(ksi, sysinfo, phwrite);
937     SAVE_UINT32(ksi, sysinfo, pswitch);
938     SAVE_UINT32(ksi, sysinfo, trap);
939     SAVE_UINT32(ksi, sysinfo, intr);
940     SAVE_UINT32(ksi, sysinfo, syscall);
941     SAVE_UINT32(ksi, sysinfo, sysread);
942     SAVE_UINT32(ksi, sysinfo, syswrite);
943     SAVE_UINT32(ksi, sysinfo, sysfork);
944     SAVE_UINT32(ksi, sysinfo, sysvfork);
945     SAVE_UINT32(ksi, sysinfo, sysexec);
946     SAVE_UINT32(ksi, sysinfo, readch);
947     SAVE_UINT32(ksi, sysinfo, writtech);
948     SAVE_UINT32(ksi, sysinfo, rcvint);
949     SAVE_UINT32(ksi, sysinfo, xmtint);
950     SAVE_UINT32(ksi, sysinfo, mdmint);
951     SAVE_UINT32(ksi, sysinfo, rawch);
952     SAVE_UINT32(ksi, sysinfo, canch);
953     SAVE_UINT32(ksi, sysinfo, outch);
954     SAVE_UINT32(ksi, sysinfo, msg);
955     SAVE_UINT32(ksi, sysinfo, sema);
956     SAVE_UINT32(ksi, sysinfo, namei);
957     SAVE_UINT32(ksi, sysinfo, ufsiget);
958     SAVE_UINT32(ksi, sysinfo, ufsdirblk);
959     SAVE_UINT32(ksi, sysinfo, ufsipage);
960     SAVE_UINT32(ksi, sysinfo, ufsinopage);
961     SAVE_UINT32(ksi, sysinfo, inodeovf);
962     SAVE_UINT32(ksi, sysinfo, fileovf);
963     SAVE_UINT32(ksi, sysinfo, procovf);
964     SAVE_UINT32(ksi, sysinfo, intrthread);
965     SAVE_UINT32(ksi, sysinfo, intrblk);
966     SAVE_UINT32(ksi, sysinfo, idlthread);
967     SAVE_UINT32(ksi, sysinfo, inv_swctch);
968     SAVE_UINT32(ksi, sysinfo, nthreads);
969     SAVE_UINT32(ksi, sysinfo, cpumigrate);
970     SAVE_UINT32(ksi, sysinfo, xcalls);
971     SAVE_UINT32(ksi, sysinfo, mutex_adenters);
972     SAVE_UINT32(ksi, sysinfo, rw_rdfails);
973     SAVE_UINT32(ksi, sysinfo, rw_wrfails);
974     SAVE_UINT32(ksi, sysinfo, modload);
975     SAVE_UINT32(ksi, sysinfo, modunload);
976     SAVE_UINT32(ksi, sysinfo, bawrite);
977 #ifdef STATISTICS /* see header file */
978     SAVE_UINT32(ksi, sysinfo, rw_enters);
979     SAVE_UINT32(ksi, sysinfo, win_uo_cnt);
980     SAVE_UINT32(ksi, sysinfo, win_uu_cnt);
981     SAVE_UINT32(ksi, sysinfo, win_so_cnt);
982     SAVE_UINT32(ksi, sysinfo, win_su_cnt);
983     SAVE_UINT32(ksi, sysinfo, win_suc_cnt);

```

```

984 #endif

986     SAVE_INT32(ksi, syswait, iowait);
987     SAVE_INT32(ksi, syswait, swap);
988     SAVE_INT32(ksi, syswait, physio);

990     SAVE_UINT32(ksi, vminfo, pgrec);
991     SAVE_UINT32(ksi, vminfo, pgfrec);
992     SAVE_UINT32(ksi, vminfo, pgin);
993     SAVE_UINT32(ksi, vminfo, pgpgin);
994     SAVE_UINT32(ksi, vminfo, pgout);
995     SAVE_UINT32(ksi, vminfo, pgpgout);
996     SAVE_UINT32(ksi, vminfo, swapin);
997     SAVE_UINT32(ksi, vminfo, pgswapin);
998     SAVE_UINT32(ksi, vminfo, swapout);
999     SAVE_UINT32(ksi, vminfo, pgswapout);
1000     SAVE_UINT32(ksi, vminfo, zfod);
1001     SAVE_UINT32(ksi, vminfo, dfree);
1002     SAVE_UINT32(ksi, vminfo, scan);
1003     SAVE_UINT32(ksi, vminfo, rev);
1004     SAVE_UINT32(ksi, vminfo, hat_fault);
1005     SAVE_UINT32(ksi, vminfo, as_fault);
1006     SAVE_UINT32(ksi, vminfo, maj_fault);
1007     SAVE_UINT32(ksi, vminfo, cow_fault);
1008     SAVE_UINT32(ksi, vminfo, prot_fault);
1009     SAVE_UINT32(ksi, vminfo, softlock);
1010     SAVE_UINT32(ksi, vminfo, kernel_asflt);
1011     SAVE_UINT32(ksi, vminfo, pgrrun);
1012     SAVE_UINT32(ksi, vminfo, execpgin);
1013     SAVE_UINT32(ksi, vminfo, execpgout);
1014     SAVE_UINT32(ksi, vminfo, execfree);
1015     SAVE_UINT32(ksi, vminfo, anonpgin);
1016     SAVE_UINT32(ksi, vminfo, anonpgout);
1017     SAVE_UINT32(ksi, vminfo, anonfree);
1018     SAVE_UINT32(ksi, vminfo, fspgin);
1019     SAVE_UINT32(ksi, vminfo, fspgout);
1020     SAVE_UINT32(ksi, vminfo, fsfree);
1021 }

1023 static void
1024 save_var(kstat_t *kp, ks_instance_t *ksi)
1025 {
1026     struct var      *var = (struct var *) (kp->ks_data);

1028     assert(kp->ks_data_size == sizeof (struct var));

1030     SAVE_INT32(ksi, var, v_buf);
1031     SAVE_INT32(ksi, var, v_call);
1032     SAVE_INT32(ksi, var, v_proc);
1033     SAVE_INT32(ksi, var, v_maxupttl);
1034     SAVE_INT32(ksi, var, v_nglobpris);
1035     SAVE_INT32(ksi, var, v_maxsyspri);
1036     SAVE_INT32(ksi, var, v_clist);
1037     SAVE_INT32(ksi, var, v_maxup);
1038     SAVE_INT32(ksi, var, v_hbuf);
1039     SAVE_INT32(ksi, var, v_hmask);
1040     SAVE_INT32(ksi, var, v_pbuf);
1041     SAVE_INT32(ksi, var, v_sptmap);
1042     SAVE_INT32(ksi, var, v_maxpmem);
1043     SAVE_INT32(ksi, var, v_autoup);
1044     SAVE_INT32(ksi, var, v_bufhwm);
1045 }

1047 static void
1048 save_ncstats(kstat_t *kp, ks_instance_t *ksi)
1049 {

```

```

1050     struct ncstats *ncstats = (struct ncstats *) (kp->ks_data);
1052     assert(kp->ks_data_size == sizeof (struct ncstats));

1054     SAVE_INT32(ksi, ncstats, hits);
1055     SAVE_INT32(ksi, ncstats, misses);
1056     SAVE_INT32(ksi, ncstats, enters);
1057     SAVE_INT32(ksi, ncstats, dbl_enters);
1058     SAVE_INT32(ksi, ncstats, long_enter);
1059     SAVE_INT32(ksi, ncstats, long_look);
1060     SAVE_INT32(ksi, ncstats, move_to_front);
1061     SAVE_INT32(ksi, ncstats, purges);
1062 }

1064 static void
1065 save_sysinfo(kstat_t *kp, ks_instance_t *ksi)
1066 {
1067     sysinfo_t *sysinfo = (sysinfo_t *) (kp->ks_data);

1069     assert(kp->ks_data_size == sizeof (sysinfo_t));

1071     SAVE_UINT32(ksi, sysinfo, updates);
1072     SAVE_UINT32(ksi, sysinfo, runque);
1073     SAVE_UINT32(ksi, sysinfo, runocc);
1074     SAVE_UINT32(ksi, sysinfo, swpque);
1075     SAVE_UINT32(ksi, sysinfo, swpocc);
1076     SAVE_UINT32(ksi, sysinfo, waiting);
1077 }

1079 static void
1080 save_vminfo(kstat_t *kp, ks_instance_t *ksi)
1081 {
1082     vminfo_t *vminfo = (vminfo_t *) (kp->ks_data);

1084     assert(kp->ks_data_size == sizeof (vminfo_t));

1086     SAVE_UINT64(ksi, vminfo, freemem);
1087     SAVE_UINT64(ksi, vminfo, swap_resv);
1088     SAVE_UINT64(ksi, vminfo, swap_alloc);
1089     SAVE_UINT64(ksi, vminfo, swap_avail);
1090     SAVE_UINT64(ksi, vminfo, swap_free);
1091     SAVE_UINT64(ksi, vminfo, updates);
1092 }

1094 static void
1095 save_nfs(kstat_t *kp, ks_instance_t *ksi)
1096 {
1097     struct mntinfo_kstat *mntinfo = (struct mntinfo_kstat *) (kp->ks_data);

1099     assert(kp->ks_data_size == sizeof (struct mntinfo_kstat));

1101     SAVE_STRING(ksi, mntinfo, mik_proto);
1102     SAVE_UINT32(ksi, mntinfo, mik_vers);
1103     SAVE_UINT32(ksi, mntinfo, mik_flags);
1104     SAVE_UINT32(ksi, mntinfo, mik_secmod);
1105     SAVE_UINT32(ksi, mntinfo, mik_curread);
1106     SAVE_UINT32(ksi, mntinfo, mik_curwrite);
1107     SAVE_INT32(ksi, mntinfo, mik_timeo);
1108     SAVE_INT32(ksi, mntinfo, mik_retrans);
1109     SAVE_UINT32(ksi, mntinfo, mik_acregmin);
1110     SAVE_UINT32(ksi, mntinfo, mik_acregmax);
1111     SAVE_UINT32(ksi, mntinfo, mik_acdirmin);
1112     SAVE_UINT32(ksi, mntinfo, mik_acdirmax);
1113     SAVE_UINT32_X(ksi, "lookup_srtt", mntinfo->mik_timers[0].srtt);
1114     SAVE_UINT32_X(ksi, "lookup_deviate", mntinfo->mik_timers[0].deviate);
1115     SAVE_UINT32_X(ksi, "lookup_rtxcur", mntinfo->mik_timers[0].rtxcur);

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1116     SAVE_UINT32_X(ksi, "read_srtt", mntinfo->mik_timers[1].srtt);
1117     SAVE_UINT32_X(ksi, "read_deviate", mntinfo->mik_timers[1].deviate);
1118     SAVE_UINT32_X(ksi, "read_rtxcur", mntinfo->mik_timers[1].rtxcur);
1119     SAVE_UINT32_X(ksi, "write_srtt", mntinfo->mik_timers[2].srtt);
1120     SAVE_UINT32_X(ksi, "write_deviate", mntinfo->mik_timers[2].deviate);
1121     SAVE_UINT32_X(ksi, "write_rtxcur", mntinfo->mik_timers[2].rtxcur);
1122     SAVE_UINT32(ksi, mntinfo, mik_noresponse);
1123     SAVE_UINT32(ksi, mntinfo, mik_failover);
1124     SAVE_UINT32(ksi, mntinfo, mik_remap);
1125     SAVE_STRING(ksi, mntinfo, mik_curserver);
1126 }

1128 #ifdef __sparc
1129 static void
1130 save_sfmmu_global_stat(kstat_t *kp, ks_instance_t *ksi)
1131 {
1132     struct sfmmu_global_stat *sfmmug =
1133         (struct sfmmu_global_stat *) (kp->ks_data);

1135     assert(kp->ks_data_size == sizeof (struct sfmmu_global_stat));

1137     SAVE_INT32(ksi, sfmmug, sf_tsb_exceptions);
1138     SAVE_INT32(ksi, sfmmug, sf_tsb_raise_exception);
1139     SAVE_INT32(ksi, sfmmug, sf_pagefaults);
1140     SAVE_INT32(ksi, sfmmug, sf_uhash_searches);
1141     SAVE_INT32(ksi, sfmmug, sf_uhash_links);
1142     SAVE_INT32(ksi, sfmmug, sf_khash_searches);
1143     SAVE_INT32(ksi, sfmmug, sf_khash_links);
1144     SAVE_INT32(ksi, sfmmug, sf_swapout);
1145     SAVE_INT32(ksi, sfmmug, sf_tsb_alloc);
1146     SAVE_INT32(ksi, sfmmug, sf_tsb_allocfail);
1147     SAVE_INT32(ksi, sfmmug, sf_tsb_sectsb_create);
1148     SAVE_INT32(ksi, sfmmug, sf_scd_1sttsb_alloc);
1149     SAVE_INT32(ksi, sfmmug, sf_scd_2ndtsb_alloc);
1150     SAVE_INT32(ksi, sfmmug, sf_scd_1sttsb_allocfail);
1151     SAVE_INT32(ksi, sfmmug, sf_scd_2ndtsb_allocfail);
1152     SAVE_INT32(ksi, sfmmug, sf_ttload8k);
1153     SAVE_INT32(ksi, sfmmug, sf_ttload64k);
1154     SAVE_INT32(ksi, sfmmug, sf_ttload512k);
1155     SAVE_INT32(ksi, sfmmug, sf_ttload4m);
1156     SAVE_INT32(ksi, sfmmug, sf_ttload32m);
1157     SAVE_INT32(ksi, sfmmug, sf_ttload256m);
1158     SAVE_INT32(ksi, sfmmug, sf_tsb_load8k);
1159     SAVE_INT32(ksi, sfmmug, sf_tsb_load4m);
1160     SAVE_INT32(ksi, sfmmug, sf_hblk_hit);
1161     SAVE_INT32(ksi, sfmmug, sf_hblk8_ncreate);
1162     SAVE_INT32(ksi, sfmmug, sf_hblk8_nalloc);
1163     SAVE_INT32(ksi, sfmmug, sf_hblk1_ncreate);
1164     SAVE_INT32(ksi, sfmmug, sf_hblk1_nalloc);
1165     SAVE_INT32(ksi, sfmmug, sf_hblk_slab_cnt);
1166     SAVE_INT32(ksi, sfmmug, sf_hblk_reserve_cnt);
1167     SAVE_INT32(ksi, sfmmug, sf_hblk_recurse_cnt);
1168     SAVE_INT32(ksi, sfmmug, sf_hblk_reserve_hit);
1169     SAVE_INT32(ksi, sfmmug, sf_get_free_success);
1170     SAVE_INT32(ksi, sfmmug, sf_get_free_throttle);
1171     SAVE_INT32(ksi, sfmmug, sf_get_free_fail);
1172     SAVE_INT32(ksi, sfmmug, sf_put_free_success);
1173     SAVE_INT32(ksi, sfmmug, sf_put_free_fail);
1174     SAVE_INT32(ksi, sfmmug, sf_pgcolor_conflict);
1175     SAVE_INT32(ksi, sfmmug, sf_uncache_conflict);
1176     SAVE_INT32(ksi, sfmmug, sf_unload_conflict);
1177     SAVE_INT32(ksi, sfmmug, sf_ism_uncache);
1178     SAVE_INT32(ksi, sfmmug, sf_ism_recache);
1179     SAVE_INT32(ksi, sfmmug, sf_recache);
1180     SAVE_INT32(ksi, sfmmug, sf_steal_count);
1181     SAVE_INT32(ksi, sfmmug, sf_pagesync);

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1182     SAVE_INT32(ksi, sfmmug, sf_clrwrt);
1183     SAVE_INT32(ksi, sfmmug, sf_pagesync_invalid);
1184     SAVE_INT32(ksi, sfmmug, sf_kernel_xcalls);
1185     SAVE_INT32(ksi, sfmmug, sf_user_xcalls);
1186     SAVE_INT32(ksi, sfmmug, sf_tsb_grow);
1187     SAVE_INT32(ksi, sfmmug, sf_tsb_shrink);
1188     SAVE_INT32(ksi, sfmmug, sf_tsb_resize_failures);
1189     SAVE_INT32(ksi, sfmmug, sf_tsb_reloc);
1190     SAVE_INT32(ksi, sfmmug, sf_user_vtop);
1191     SAVE_INT32(ksi, sfmmug, sf_ctx_inv);
1192     SAVE_INT32(ksi, sfmmug, sf_tlb_reprog_pgsz);
1193     SAVE_INT32(ksi, sfmmug, sf_region_remap_demap);
1194     SAVE_INT32(ksi, sfmmug, sf_create_scd);
1195     SAVE_INT32(ksi, sfmmug, sf_join_scd);
1196     SAVE_INT32(ksi, sfmmug, sf_leave_scd);
1197     SAVE_INT32(ksi, sfmmug, sf_destroy_scd);
1198 }
1199 #endif

1201 #ifdef __sparc
1202 static void
1203 save_sfmmu_tsbsize_stat(kstat_t *kp, ks_instance_t *ksi)
1204 {
1205     struct sfmmu_tsbsize_stat *sfmmut;

1207     assert(kp->ks_data_size == sizeof (struct sfmmu_tsbsize_stat));
1208     sfmmut = (struct sfmmu_tsbsize_stat *) (kp->ks_data);

1210     SAVE_INT32(ksi, sfmmut, sf_tsbsz_8k);
1211     SAVE_INT32(ksi, sfmmut, sf_tsbsz_16k);
1212     SAVE_INT32(ksi, sfmmut, sf_tsbsz_32k);
1213     SAVE_INT32(ksi, sfmmut, sf_tsbsz_64k);
1214     SAVE_INT32(ksi, sfmmut, sf_tsbsz_128k);
1215     SAVE_INT32(ksi, sfmmut, sf_tsbsz_256k);
1216     SAVE_INT32(ksi, sfmmut, sf_tsbsz_512k);
1217     SAVE_INT32(ksi, sfmmut, sf_tsbsz_1m);
1218     SAVE_INT32(ksi, sfmmut, sf_tsbsz_2m);
1219     SAVE_INT32(ksi, sfmmut, sf_tsbsz_4m);
1220 }
1221 #endif

1223 #ifdef __sparc
1224 static void
1225 save_simmstat(kstat_t *kp, ks_instance_t *ksi)
1226 {
1227     uchar_t *simmstat;
1228     char *simm_buf;
1229     char *list = NULL;
1230     int i;

1232     assert(kp->ks_data_size == sizeof (uchar_t) * SIMM_COUNT);

1234     for (i = 0, simmstat = (uchar_t *) (kp->ks_data); i < SIMM_COUNT - 1;
1235          i++, simmstat++) {
1236         if (list == NULL) {
1237             (void) asprintf(&simm_buf, "%d,", *simmstat);
1238         } else {
1239             (void) asprintf(&simm_buf, "%s%d,", list, *simmstat);
1240             free(list);
1241         }
1242         list = simm_buf;
1243     }

1245     (void) asprintf(&simm_buf, "%s%d", list, *simmstat);
1246     SAVE_STRING_X(ksi, "status", simm_buf);
1247     free(list);

```

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1248         free(simm_buf);
1249     }
1250 #endif

1252 #ifdef __sparc
1253 /*
1254  * Helper function for save_temperature().
1255  */
1256 static char *
1257 short_array_to_string(short *shortp, int len)
1258 {
1259     char *list = NULL;
1260     char *list_buf;

1262     for (; len > 1; len--, shortp++) {
1263         if (list == NULL) {
1264             (void) asprintf(&list_buf, "%d,", *shortp);
1265         } else {
1266             (void) asprintf(&list_buf, "%s%d,", list, *shortp);
1267             free(list);
1268         }
1269         list = list_buf;
1270     }

1272     (void) asprintf(&list_buf, "%s%s", list, *shortp);
1273     free(list);
1274     return (list_buf);
1275 }

1277 static void
1278 save_temperature(kstat_t *kp, ks_instance_t *ksi)
1279 {
1280     struct temp_stats *temps = (struct temp_stats *) (kp->ks_data);
1281     char *buf;
1282     int n = 1;

1284     assert(kp->ks_data_size == sizeof (struct temp_stats));

1286     SAVE_UINT32(ksi, temps, index);

1288     buf = short_array_to_string(temps->l1, L1_SZ);
1289     SAVE_STRING_X(ksi, "l1", buf);
1290     free(buf);

1292     buf = short_array_to_string(temps->l2, L2_SZ);
1293     SAVE_STRING_X(ksi, "l2", buf);
1294     free(buf);

1296     buf = short_array_to_string(temps->l3, L3_SZ);
1297     SAVE_STRING_X(ksi, "l3", buf);
1298     free(buf);

1300     buf = short_array_to_string(temps->l4, L4_SZ);
1301     SAVE_STRING_X(ksi, "l4", buf);
1302     free(buf);

1304     buf = short_array_to_string(temps->l5, L5_SZ);
1305     SAVE_STRING_X(ksi, "l5", buf);
1306     free(buf);

1308     SAVE_INT32(ksi, temps, max);
1309     SAVE_INT32(ksi, temps, min);
1310     SAVE_INT32(ksi, temps, state);
1311     SAVE_INT32(ksi, temps, temp_cnt);
1312     SAVE_INT32(ksi, temps, shutdown_cnt);
1313     SAVE_INT32(ksi, temps, version);

```

```

1314     SAVE_INT32(ksi, temps, trend);
1315     SAVE_INT32(ksi, temps, override);
1316 }
1317 #endif

1319 #ifdef __sparc
1320 static void
1321 save_temp_over(kstat_t *kp, ks_instance_t *ksi)
1322 {
1323     short *sh = (short *) (kp->ks_data);
1324     char *value;

1326     assert(kp->ks_data_size == sizeof (short));

1328     (void) asprintf(&value, "%hu", *sh);
1329     SAVE_STRING_X(ksi, "override", value);
1330     free(value);
1331 }
1332 #endif

1334 #ifdef __sparc
1335 static void
1336 save_ps_shadow(kstat_t *kp, ks_instance_t *ksi)
1337 {
1338     uchar_t *uchar = (uchar_t *) (kp->ks_data);

1340     assert(kp->ks_data_size == SYS_PS_COUNT);

1342     SAVE_CHAR_X(ksi, "core_0", *uchar++);
1343     SAVE_CHAR_X(ksi, "core_1", *uchar++);
1344     SAVE_CHAR_X(ksi, "core_2", *uchar++);
1345     SAVE_CHAR_X(ksi, "core_3", *uchar++);
1346     SAVE_CHAR_X(ksi, "core_4", *uchar++);
1347     SAVE_CHAR_X(ksi, "core_5", *uchar++);
1348     SAVE_CHAR_X(ksi, "core_6", *uchar++);
1349     SAVE_CHAR_X(ksi, "core_7", *uchar++);
1350     SAVE_CHAR_X(ksi, "pps_0", *uchar++);
1351     SAVE_CHAR_X(ksi, "clk_33", *uchar++);
1352     SAVE_CHAR_X(ksi, "clk_50", *uchar++);
1353     SAVE_CHAR_X(ksi, "v5_p", *uchar++);
1354     SAVE_CHAR_X(ksi, "v12_p", *uchar++);
1355     SAVE_CHAR_X(ksi, "v5_aux", *uchar++);
1356     SAVE_CHAR_X(ksi, "v5_p_pch", *uchar++);
1357     SAVE_CHAR_X(ksi, "v12_p_pch", *uchar++);
1358     SAVE_CHAR_X(ksi, "v3_pch", *uchar++);
1359     SAVE_CHAR_X(ksi, "v5_pch", *uchar++);
1360     SAVE_CHAR_X(ksi, "p_fan", *uchar++);
1361 }
1362 #endif

1364 #ifdef __sparc
1365 static void
1366 save_fault_list(kstat_t *kp, ks_instance_t *ksi)
1367 {
1368     struct ft_list *fault;
1369     char name[KSTAT_STRLEN + 7];
1370     int i;

1372     for (i = 1, fault = (struct ft_list *) (kp->ks_data);
1373          i <= 999999 && i <= kp->ks_data_size / sizeof (struct ft_list);
1374          i++, fault++) {
1375         (void) snprintf(name, sizeof (name), "unit_%d", i);
1376         SAVE_INT32_X(ksi, name, fault->unit);
1377         (void) snprintf(name, sizeof (name), "type_%d", i);
1378         SAVE_INT32_X(ksi, name, fault->type);
1379         (void) snprintf(name, sizeof (name), "fclass_%d", i);

```

```

1380     SAVE_INT32_X(ksi, name, fault->fclass);
1381     (void) snprintf(name, sizeof (name), "create_time_%d", i);
1382     SAVE_HRTIME_X(ksi, name, fault->create_time);
1383     (void) snprintf(name, sizeof (name), "msg_%d", i);
1384     SAVE_STRING_X(ksi, name, faultp->msg);
1385 }
1386 }
1387 #endif

1389 static void
1390 save_named(kstat_t *kp, ks_instance_t *ksi)
1391 {
1392     kstat_named_t *knp;
1393     int n;

1395     for (n = kp->ks_ndata, knp = KSTAT_NAMED_PTR(kp); n > 0; n--, knp++) {
1396         switch (knp->data_type) {
1397             case KSTAT_DATA_CHAR:
1398                 nvpair_insert(ksi, knp->name,
1399                             (ks_value_t *)&knp->value, KSTAT_DATA_CHAR);
1400                 break;
1401             case KSTAT_DATA_INT32:
1402                 nvpair_insert(ksi, knp->name,
1403                             (ks_value_t *)&knp->value, KSTAT_DATA_INT32);
1404                 break;
1405             case KSTAT_DATA_UINT32:
1406                 nvpair_insert(ksi, knp->name,
1407                             (ks_value_t *)&knp->value, KSTAT_DATA_UINT32);
1408                 break;
1409             case KSTAT_DATA_INT64:
1410                 nvpair_insert(ksi, knp->name,
1411                             (ks_value_t *)&knp->value, KSTAT_DATA_INT64);
1412                 break;
1413             case KSTAT_DATA_UINT64:
1414                 nvpair_insert(ksi, knp->name,
1415                             (ks_value_t *)&knp->value, KSTAT_DATA_UINT64);
1416                 break;
1417             case KSTAT_DATA_STRING:
1418                 SAVE_STRING_X(ksi, knp->name, KSTAT_NAMED_STR_PTR(knp));
1419                 break;
1420             default:
1421                 assert(B_FALSE); /* Invalid data type */
1422                 break;
1423         }
1424     }
1425 }

1427 static void
1428 save_intr(kstat_t *kp, ks_instance_t *ksi)
1429 {
1430     kstat_intr_t *intr = KSTAT_INTR_PTR(kp);
1431     char *intr_names[] = {"hard", "soft", "watchdog", "spurious",
1432                          "multiple_service"};
1433     int n;

1435     for (n = 0; n < KSTAT_NUM_INTRS; n++)
1436         SAVE_UINT32_X(ksi, intr_names[n], intr->intrs[n]);
1437 }

1439 static void
1440 save_io(kstat_t *kp, ks_instance_t *ksi)
1441 {
1442     kstat_io_t *ksio = KSTAT_IO_PTR(kp);

1444     SAVE_UINT64(ksi, ksio, nread);
1445     SAVE_UINT64(ksi, ksio, nwritten);

```

```
1446     SAVE_UINT32(ksi, ksio, reads);
1447     SAVE_UINT32(ksi, ksio, writes);
1448     SAVE_HRTIME(ksi, ksio, wtime);
1449     SAVE_HRTIME(ksi, ksio, wlentime);
1450     SAVE_HRTIME(ksi, ksio, wlastupdate);
1451     SAVE_HRTIME(ksi, ksio, rtime);
1452     SAVE_HRTIME(ksi, ksio, rlentime);
1453     SAVE_HRTIME(ksi, ksio, rlastupdate);
1454     SAVE_UINT32(ksi, ksio, wcnt);
1455     SAVE_UINT32(ksi, ksio, rcnt);
1456 }

1458 static void
1459 save_timer(kstat_t *kp, ks_instance_t *ksi)
1460 {
1461     kstat_timer_t *ktimer = KSTAT_TIMER_PTR(kp);

1463     SAVE_STRING(ksi, ktimer, name);
1464     SAVE_UINT64(ksi, ktimer, num_events);
1465     SAVE_HRTIME(ksi, ktimer, elapsed_time);
1466     SAVE_HRTIME(ksi, ktimer, min_time);
1467     SAVE_HRTIME(ksi, ktimer, max_time);
1468     SAVE_HRTIME(ksi, ktimer, start_time);
1469     SAVE_HRTIME(ksi, ktimer, stop_time);
1470 }
1471 #endif /* ! codereview */
```

```

*****
7042 Thu Jan 24 11:08:37 2013
new/usr/src/cmd/stat/kstat/kstat.h
749 "/usr/bin/kstat" should be rewritten in C
Reviewed by: Garrett D'Amore <garrett@damore.org>
Reviewed by: Brendan Gregg <brendan.gregg@joyent.com>
*****
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6  * You may not use this file except in compliance with the License.
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16 * fields enclosed by brackets "[]" replaced with your own identifying
17 * information: Portions Copyright [yyyy] [name of copyright owner]
18 *
19 * CDDL HEADER END
20 */
21 /*
22 * Copyright 2006 Sun Microsystems, Inc. All rights reserved.
23 * Copyright 2013 David Hoepfner. All rights reserved.
24 * Copyright 2013 Nexenta Systems, Inc. All rights reserved.
25 */

27 #ifndef _STAT_KSTAT_H
28 #define _STAT_KSTAT_H

30 /*
31  * Structures needed by the kstat reader functions.
32  */
33 #include <sys/var.h>
34 #include <sys/utsname.h>
35 #include <sys/sysinfo.h>
36 #include <sys/flock.h>
37 #include <sys/dncl.h>
38 #include <regex.h>
39 #include <nfs/nfs.h>
40 #include <nfs/nfs_clnt.h>

42 #ifdef __sparc
43 #include <vm/hat_sfmmu.h>
44 #include <sys/simmstat.h>
45 #include <sys/sysctrl.h>
46 #include <sys/fhc.h>
47 #endif

49 #define KSTAT_DATA_HRTIME      (KSTAT_DATA_STRING + 1)

51 typedef union ks_value {
52     char        c[16];
53     int32_t     i32;
54     uint32_t    ui32;
55     struct {
56         union {
57             char    *ptr;
58             char    __pad[8];
59         };

```

```

60         uint32_t    len;
61     } str;

63     int64_t     i64;
64     uint64_t    ui64;
65 } ks_value_t;

67 #define SAVE_HRTIME(I, S, N)      \
68 {                                \
69     ks_value_t v;                \
70     v.ui64 = S->N;                \
71     nvpair_insert(I, #N, &v, KSTAT_DATA_UINT64); \
72 }

74 #define SAVE_INT32(I, S, N)      \
75 {                                \
76     ks_value_t v;                \
77     v.i32 = S->N;                \
78     nvpair_insert(I, #N, &v, KSTAT_DATA_INT32); \
79 }

81 #define SAVE_UINT32(I, S, N)     \
82 {                                \
83     ks_value_t v;                \
84     v.ui32 = S->N;                \
85     nvpair_insert(I, #N, &v, KSTAT_DATA_UINT32); \
86 }

88 #define SAVE_INT64(I, S, N)      \
89 {                                \
90     ks_value_t v;                \
91     v.i64 = S->N;                \
92     nvpair_insert(I, #N, &v, KSTAT_DATA_INT64); \
93 }

95 #define SAVE_UINT64(I, S, N)     \
96 {                                \
97     ks_value_t v;                \
98     v.ui64 = S->N;                \
99     nvpair_insert(I, #N, &v, KSTAT_DATA_UINT64); \
100 }

102 /*
103  * We dont want const "strings" because we free
104  * the instances later.
105  */
106 #define SAVE_STRING(I, S, N)     \
107 {                                \
108     ks_value_t v;                \
109     v.str.addr.ptr = safe_strdup(S->N); \
110     v.str.len = strlen(S->N);        \
111     nvpair_insert(I, #N, &v, KSTAT_DATA_STRING); \
112 }

114 #define SAVE_HRTIME_X(I, N, V)   \
115 {                                \
116     ks_value_t v;                \
117     v.ui64 = V;                  \
118     nvpair_insert(I, N, &v, KSTAT_DATA_HRTIME); \
119 }

121 #define SAVE_INT32_X(I, N, V)   \
122 {                                \
123     ks_value_t v;                \
124     v.i32 = V;                  \
125     nvpair_insert(I, N, &v, KSTAT_DATA_INT32); \

```

```

126 }
128 #define SAVE_UINT32_X(I, N, V) \
129 { \
130     ks_value_t v; \
131     v.ui32 = V; \
132     nvpair_insert(I, N, &v, KSTAT_DATA_UINT32); \
133 }
135 #define SAVE_UINT64_X(I, N, V) \
136 { \
137     ks_value_t v; \
138     v.ui64 = V; \
139     nvpair_insert(I, N, &v, KSTAT_DATA_UINT64); \
140 }
142 #define SAVE_STRING_X(I, N, V) \
143 { \
144     ks_value_t v; \
145     v.str.addr.ptr = safe_strdup(V); \
146     v.str.len = strlen(V); \
147     nvpair_insert(I, N, &v, KSTAT_DATA_STRING); \
148 }
150 #define SAVE_CHAR_X(I, N, V) \
151 { \
152     ks_value_t v; \
153     asprintf(&v.str.addr.ptr, "%c", V); \
154     v.str.len = 1; \
155     nvpair_insert(I, N, &v, KSTAT_DATA_STRING); \
156 }
158 #define DFLT_FMT \
159 "module: %-30.30s instance: %-6d\n" \
160 "name: %-30.30s class: %-.30s\n"
162 #define JSON_FMT \
163 "{\n\t\"module\": \"%s\", \n" \
164 "\t\"instance\": %d, \n" \
165 "\t\"name\": \"%s\", \n" \
166 "\t\"class\": \"%s\", \n" \
167 "\t\"type\": %d, \n"
169 #define KS_DFMT "\t%-30s "
170 #define KS_JFMT "\t\t\"%s\": "
171 #define KS_PFMT "%s:%d:%s:%s"
173 typedef struct ks_instance {
174     list_node_t    ks_next;
175     char           ks_name[KSTAT_STRLEN];
176     char           ks_module[KSTAT_STRLEN];
177     char           ks_class[KSTAT_STRLEN];
178     int            ks_instance;
179     uchar_t       ks_type;
180     hrtime_t      ks_snaptime;
181     list_t        ks_nvlist;
182 } ks_instance_t;
184 typedef struct ks_nvpair {
185     list_node_t    nv_next;
186     char           name[KSTAT_STRLEN];
187     uchar_t       data_type;
188     ks_value_t    value;
189 } ks_nvpair_t;
191 typedef struct ks_pattern {

```

```

192     char           *pstr;
193     regex_t       preg;
194 } ks_pattern_t;
196 typedef struct ks_selector {
197     list_node_t    ks_next;
198     ks_pattern_t   ks_module;
199     ks_pattern_t   ks_instance;
200     ks_pattern_t   ks_name;
201     ks_pattern_t   ks_statistic;
202 } ks_selector_t;
204 static void      usage(void);
205 static int       compare_instances(ks_instance_t *, ks_instance_t *);
206 static void      nvpair_insert(ks_instance_t *, char *, ks_value_t *, uchar_t);
207 static boolean_t ks_match(const char *, ks_pattern_t *);
208 static ks_selector_t *new_selector(void);
209 static void      ks_instances_read(kstat_ctl_t *);
210 static void      ks_value_print(ks_nvpair_t *);
211 static void      ks_instance_print(ks_instance_t *, ks_nvpair_t *);
212 static void      ks_instances_print(void);
213 static char      *ks_safe_strdup(char *);
214 static void      ks_sleep_until(hrtime_t *, hrtime_t, int, int *);
216 /* Raw kstat readers */
217 static void      save_cpu_stat(kstat_t *, ks_instance_t *);
218 static void      save_var(kstat_t *, ks_instance_t *);
219 static void      save_ncstats(kstat_t *, ks_instance_t *);
220 static void      save_sysinfo(kstat_t *, ks_instance_t *);
221 static void      save_vminfo(kstat_t *, ks_instance_t *);
222 static void      save_nfs(kstat_t *, ks_instance_t *);
223 #ifdef __sparc
224 static void      save_sfmmu_global_stat(kstat_t *, ks_instance_t *);
225 static void      save_sfmmu_tsbsize_stat(kstat_t *, ks_instance_t *);
226 static void      save_simmstat(kstat_t *, ks_instance_t *);
227 /* Helper function for save_temperature() */
228 static char      *short_array_to_string(short *, int);
229 static void      save_temperature(kstat_t *, ks_instance_t *);
230 static void      save_temp_over(kstat_t *, ks_instance_t *);
231 static void      save_ps_shadow(kstat_t *, ks_instance_t *);
232 static void      save_fault_list(kstat_t *, ks_instance_t *);
233 #endif
235 /* Named kstat readers */
236 static void      save_named(kstat_t *, ks_instance_t *);
237 static void      save_intr(kstat_t *, ks_instance_t *);
238 static void      save_io(kstat_t *, ks_instance_t *);
239 static void      save_timer(kstat_t *, ks_instance_t *);
241 /* Typedef for raw kstat reader functions */
242 typedef void      (*kstat_raw_reader_t)(kstat_t *, ks_instance_t *);
244 static struct {
245     kstat_raw_reader_t fn;
246     char *name;
247 } ks_raw_lookup[] = {
248     /* Function name                               kstat name */
249     {save_cpu_stat, "cpu_stat:cpu_stat"},
250     {save_var, "unix:var"},
251     {save_ncstats, "unix:ncstats"},
252     {save_sysinfo, "unix:sysinfo"},
253     {save_vminfo, "unix:vminfo"},
254     {save_nfs, "nfs:mntinfo"},
255 #ifdef __sparc
256     {save_sfmmu_global_stat, "unix:sfmmu_global_stat"},
257     {save_sfmmu_tsbsize_stat, "unix:sfmmu_tsbsize_stat"},

```



```
258     {save_simmstat,          "unix:simm-status"},
259     {save_temperature,     "unix:temperature"},
260     {save_temp_over,       "unix:temperature override"},
261     {save_ps_shadow,       "unix:ps_shadow"},
262     {save_fault_list,     "unix:fault_list"},
263 #endif
264     {NULL, NULL},
265 };

267 static kstat_raw_reader_t lookup_raw_kstat_fn(char *, char *);

269 #endif /* _STAT_KSTAT_H */
270 #endif /* ! codereview */
```

```

*****
9151 Thu Jan 24 11:08:38 2013
new/usr/src/man/man1m/kstat.1m
749 "/usr/bin/kstat" should be rewritten in C
Reviewed by: Garrett D'Amore <garrett@damore.org>
Reviewed by: Brendan Gregg <brendan.gregg@joyent.com>
*****
1 \" te
2 .\" Copyright (c) 2000, Sun Microsystems, Inc. All Rights Reserved
3 .\" The contents of this file are subject to the terms of the Common Development
4 .\" See the License for the specific language governing permissions and limitat
5 .\" the fields enclosed by brackets \"[]\" replaced with your own identifying info
6 .TH KSTAT 1M \"Jan 9, 2013\"
6 .TH KSTAT 1M \"Mar 23, 2009\"
7 .SH NAME
8 kstat \- display kernel statistics
9 .SH SYNOPSIS
10 .LP
11 .nf
12 \fBkstat\fR [\fB-Cjlpq\fR] [\fB-T\fR u | d ] [\fB-c\fR \fIclass\fR] [\fB-m\fR \fI
12 \fBkstat\fR [\fB-lpq\fR] [\fB-T\fR u | d ] [\fB-c\fR \fIclass\fR] [\fB-m\fR \fI
13 [\fB-i\fR \fIinstance\fR] [\fB-n\fR \fIname\fR] [\fB-s\fR \fIstatistic\fR]
14 [interval [count]]
15 .fi
17 .LP
18 .nf
19 \fBkstat\fR [\fB-Cjlpq\fR] [\fB-T\fR u | d ] [\fB-c\fR \fIclass\fR]
19 \fBkstat\fR [\fB-lpq\fR] [\fB-T\fR u | d ] [\fB-c\fR \fIclass\fR]
20 [\fImodule\fR:\fIinstance\fR:\fIname\fR:\fIstatistic\fR]...
21 [interval [count]]
22 .fi
24 .SH DESCRIPTION
25 .sp
26 .LP
27 The \fBkstat\fR utility examines the available kernel statistics, or kstats, on
28 the system and reports those statistics which match the criteria specified on
29 the command line. Each matching statistic is printed with its module, instance,
30 and name fields, as well as its actual value.
31 .sp
32 .LP
33 Kernel statistics may be published by various kernel subsystems, such as
34 drivers or loadable modules; each kstat has a module field that denotes its
35 publisher. Since each module might have countable entities (such as multiple
36 disks associated with the \fBsd\fR(7D) driver) for which it wishes to report
37 statistics, the kstat also has an instance field to index the statistics for
38 each entity; kstat instances are numbered starting from zero. Finally, the
39 kstat is given a name unique within its module.
40 .sp
41 .LP
42 Each kstat may be a special kstat type, an array of name-value pairs, or raw
43 data. In the name-value case, each reported value is given a label, which we
44 refer to as the statistic. Known raw and special kstats are given statistic
45 labels for each of their values by \fBkstat\fR; thus, all published values can
46 be referenced as \fImodule\fR:\fIinstance\fR:\fIname\fR:\fIstatistic\fR.
47 .sp
48 .LP
49 When invoked without any module operands or options, kstat will match all
50 defined statistics on the system. Example invocations are provided below. All
51 times are displayed as fractional seconds since system boot.
52 .SH OPTIONS
53 .sp
54 .LP
55 The tests specified by the following options are logically ANDed, and all
56 matching kstats will be selected. A regular expression containing shell

```

```

57 metacharacters must be protected from the shell by enclosing it with the
58 appropriate quotes.
59 .sp
60 .LP
61 The argument for the \fB-c\fR, \fB-i\fR, \fB-m\fR, \fB-n\fR, and \fB-s\fR
62 options may be specified as a shell glob pattern, or a regular expression
62 options may be specified as a shell glob pattern, or a Perl regular expression
63 enclosed in '/' characters.
64 .sp
65 .ne 2
66 .na
67 \fB\FB-C\FR\FR
68 .ad
69 .RS 16n
70 Displays output in parseable format with a colon as separator.
71 .RE
73 .sp
74 .ne 2
75 .na
76 #endif /* ! codereview */
77 \fB\FB-c\FR \fIclass\FR\FR
78 .ad
79 .RS 16n
80 Displays only kstats that match the specified class. \fIclass\fR is a
81 kernel-defined string which classifies the "type" of the kstat.
82 .RE
84 .sp
85 .ne 2
86 .na
87 \fB\FB-i\FR \fIinstance\FR\FR
88 .ad
89 .RS 16n
90 Displays only kstats that match the specified instance.
91 .RE
93 .sp
94 .ne 2
95 .na
96 \fB\FB-j\FR\FR
97 .ad
98 .RS 16n
99 Displays output in JSON format.
100 .RE
102 .sp
103 .ne 2
104 .na
105 #endif /* ! codereview */
106 \fB\FB-l\FR\FR
107 .ad
108 .RS 16n
109 Lists matching kstat names without displaying values.
110 .RE
112 .sp
113 .ne 2
114 .na
115 \fB\FB-m\FR \fImodule\FR\FR
116 .ad
117 .RS 16n
118 Displays only kstats that match the specified module.
119 .RE
121 .sp

```

```

122 .ne 2
123 .na
124 \fB\fB-n\fR \fIname\fR\fR
125 .ad
126 .RS 16n
127 Displays only kstats that match the specified name.
128 .RE

130 .sp
131 .ne 2
132 .na
133 \fB\fB-p\fR\fR
134 .ad
135 .RS 16n
136 Displays output in parseable format. All example output in this document is
137 given in this format. If this option is not specified, \fBkstat\fR produces
138 output in a human-readable, table format.
139 .RE

141 .sp
142 .ne 2
143 .na
144 \fB\fB-q\fR\fR
145 .ad
146 .RS 16n
147 Displays no output, but return appropriate exit status for matches against
148 given criteria.
149 .RE

151 .sp
152 .ne 2
153 .na
154 \fB\fB-s\fR \fIstatistic\fR\fR
155 .ad
156 .RS 16n
157 Displays only kstats that match the specified statistic.
158 .RE

160 .sp
161 .ne 2
162 .na
163 \fB\fB-T\fR d | u\fR
164 .ad
165 .RS 16n
166 Displays a time stamp before each statistics block, either in \fBdate\fR(1)
167 format (\fBd\fR) or as an alphanumeric representation of the value returned by
168 \fBtime\fR(2) (\fBu\fR).
169 .RE

171 .SH OPERANDS
172 .sp
173 .LP
174 The following operands are supported:
175 .sp
176 .ne 2
177 .na
178 \fB\fImodule\fR:\fIinstance\fR:\fIname\fR:\fIstatistic\fR\fR
179 .ad
180 .sp .6
181 .RS 4n
182 Alternate method of specifying module, instance, name, and statistic as
183 described above. Each of the module, instance, name, or statistic specifiers
184 may be a shell glob pattern or a regular expression enclosed by '/'
185 67 may be a shell glob pattern or a Perl regular expression enclosed by '/'
186 characters. It is possible to use both specifier types within a single operand.
186 Leaving a specifier empty is equivalent to using the '*' glob pattern for that

```

```

187 specifier.
188 .RE

190 .sp
191 .ne 2
192 .na
193 \fB\fIinterval\fR\fR
194 .ad
195 .sp .6
196 .RS 4n
197 The number of seconds between reports.
198 .RE

200 .sp
201 .ne 2
202 .na
203 \fB\fIcount\fR\fR
204 .ad
205 .sp .6
206 .RS 4n
207 The number of reports to be printed.
208 .RE

210 .SH EXAMPLES
211 .sp
212 .LP
213 In the following examples, all the command lines in a block produce the same
214 output, as shown immediately below. The exact statistics and values will of
215 course vary from machine to machine.
216 .LP
217 \fBExample 1\fR Using the \fBkstat\fR Command
218 .sp
219 .in +2
220 .nf
221 example$ \fBkstat -p -m unix -i 0 -n system_misc -s 'avenrun*'\fR
222 example$ \fBkstat -p -s 'avenrun*'\fR
223 example$ \fBkstat -p 'unix:0:system_misc:avenrun*'\fR
224 example$ \fBkstat -p ':::avenrun*'\fR
225 example$ \fBkstat -p '::-^avenrun_[0-9]+min$'\fR
226 example$ \fBkstat -p '::-^avenrun_?d+min$'\fR

227 unix:0:system_misc:avenrun_15min      3
228 unix:0:system_misc:avenrun_1min      4
229 unix:0:system_misc:avenrun_5min      2
230 .fi
231 .in -2
232 .sp

234 .LP
235 \fBExample 2\fR Using the \fBkstat\fR Command
236 .sp
237 .in +2
238 .nf
239 example$ \fBkstat -p -m cpu_stat -s 'intr*'\fR
240 example$ \fBkstat -p cpu_stat::-^intr/\fR

242 cpu_stat:0:cpu_stat0:intr      29682330
243 cpu_stat:0:cpu_stat0:intrblk   87
244 cpu_stat:0:cpu_stat0:intrthread 15054222
245 cpu_stat:1:cpu_stat1:intr      426073
246 cpu_stat:1:cpu_stat1:intrblk   51
247 cpu_stat:1:cpu_stat1:intrthread 289668
248 cpu_stat:2:cpu_stat2:intr      134160
249 cpu_stat:2:cpu_stat2:intrblk   0
250 cpu_stat:2:cpu_stat2:intrthread 131
251 cpu_stat:3:cpu_stat3:intr      196566

```

```

252 cpu_stat:3:cpu_stat3:intrblk    30
253 cpu_stat:3:cpu_stat3:intrthread 59626
254 .fi
255 .in -2
256 .sp

258 .LP
259 \fBExample 3 \fRUsing the \fBkstat\fR Command
260 .sp
261 .in +2
262 .nf
263 example$ \fBkstat -p :::state '::::avenrun*'\fR
264 example$ \fBkstat -p :::state :::/^avenrun/\fR

266 cpu_info:0:cpu_info0:state      on-line
267 cpu_info:1:cpu_info1:state      on-line
268 cpu_info:2:cpu_info2:state      on-line
269 cpu_info:3:cpu_info3:state      on-line
270 unix:0:system_misc:avenrun_15min 4
271 unix:0:system_misc:avenrun_1min 10
272 unix:0:system_misc:avenrun_5min 3
273 .fi
274 .in -2
275 .sp

277 .LP
278 \fBExample 4 \fRUsing the \fBkstat\fR Command
279 .sp
280 .in +2
281 .nf
282 example$ \fBkstat -p 'unix:0:system_misc:avenrun*' 1 3\fR
283 unix:0:system_misc:avenrun_15min 15
284 unix:0:system_misc:avenrun_1min 11
285 unix:0:system_misc:avenrun_5min 21

287 unix:0:system_misc:avenrun_15min 15
288 unix:0:system_misc:avenrun_1min 11
289 unix:0:system_misc:avenrun_5min 21

291 unix:0:system_misc:avenrun_15min 15
292 unix:0:system_misc:avenrun_1min 11
293 unix:0:system_misc:avenrun_5min 21
294 .fi
295 .in -2
296 .sp

298 .LP
299 \fBExample 5 \fRUsing the \fBkstat\fR Command
300 .sp
301 .in +2
302 .nf
303 example$ \fBkstat -p -T d 'unix:0:system_misc:avenrun*' 5 2\fR
304 Thu Jul 22 19:39:50 1999
305 unix:0:system_misc:avenrun_15min 12
306 unix:0:system_misc:avenrun_1min 0
307 unix:0:system_misc:avenrun_5min 11

309 Thu Jul 22 19:39:55 1999
310 unix:0:system_misc:avenrun_15min 12
311 unix:0:system_misc:avenrun_1min 0
312 unix:0:system_misc:avenrun_5min 11
313 .fi
314 .in -2
315 .sp

317 .LP

```

```

318 \fBExample 6 \fRUsing the \fBkstat\fR Command
319 .sp
320 .in +2
321 .nf
322 example$ \fBkstat -p -T u 'unix:0:system_misc:avenrun*'\fR
323 932668656
324 unix:0:system_misc:avenrun_15min 14
325 unix:0:system_misc:avenrun_1min 5
326 unix:0:system_misc:avenrun_5min 18
327 .fi
328 .in -2
329 .sp

331 .SH EXIT STATUS
332 .sp
333 .LP
334 The following exit values are returned:
335 .sp
336 .ne 2
337 .na
338 \fB\fB0\fR\fR
339 .ad
340 .RS 5n
341 One or more statistics were matched.
342 .RE

344 .sp
345 .ne 2
346 .na
347 \fB\fB1\fR\fR
348 .ad
349 .RS 5n
350 No statistics were matched.
351 .RE

353 .sp
354 .ne 2
355 .na
356 \fB\fB2\fR\fR
357 .ad
358 .RS 5n
359 Invalid command line options were specified.
360 .RE

362 .sp
363 .ne 2
364 .na
365 \fB\fB3\fR\fR
366 .ad
367 .RS 5n
368 A fatal error occurred.
369 .RE

371 .SH FILES
372 .sp
373 .ne 2
374 .na
375 \fB\fB/dev/kstat\fR\fR
376 .ad
377 .RS 14n
378 kernel statistics driver
379 .RE

381 .SH SEE ALSO
382 .sp
383 .LP

```

```
384 \fBdate\fR(1), \fBsh\fR(1), \fBtime\fR(2), \fBgmatch\fR(3GEN),
385 \fBkstat\fR(3KSTAT), \fBattributes\fR(5), \fBregex\fR(5), \fBkstat\fR(7D),
386 \fBsd\fR(7D), \fBkstat\fR(9S)
268 \fBkstat\fR(3KSTAT), \fBattributes\fR(5), \fBkstat\fR(7D), \fBsd\fR(7D),
269 \fBkstat\fR(9S)
387 .SH NOTES
388 .sp
389 .LP
390 If the pattern argument contains glob or RE metacharacters which are also
273 If the pattern argument contains glob or Perl RE metacharacters which are also
391 shell metacharacters, it will be necessary to enclose the pattern with
392 appropriate shell quotes.
```