Proactive Monitoring and Operational Support

Richard Smrcina
Velocity Software, Inc.
MVMUA – April, 2017

VELOCITY SOFTWARE

PROVEN PERFORMANCE

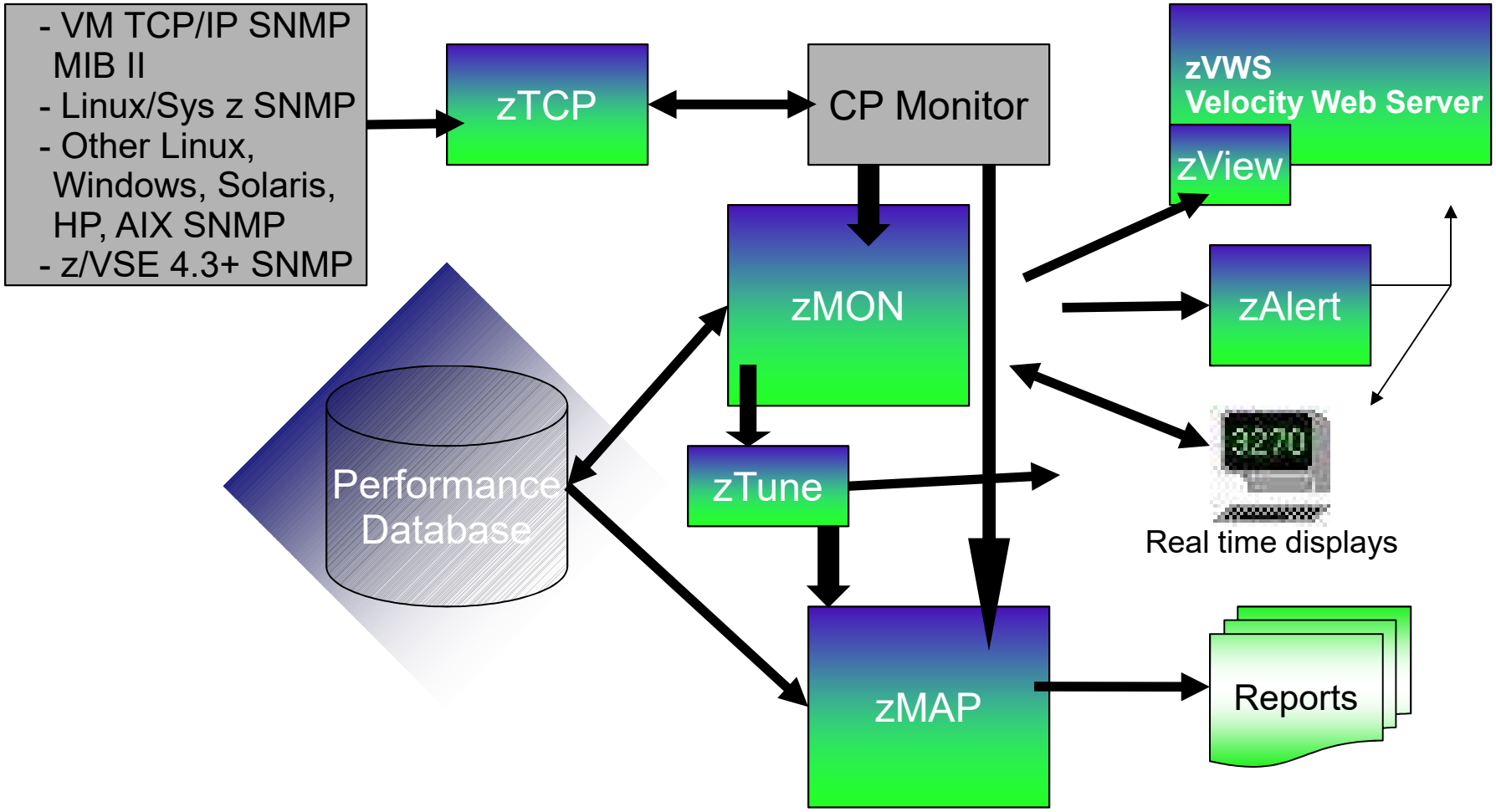
Terms

- **Proactive Monitoring**
  - A process or application that runs on the system to review critical data points
  - Provides notification if a limit is exceeded or an undesired state is encountered
  - Keeps a watchful eye on the system to free up time for 'real' work
- **Operational Support**
  - Functions or procedures that aid in the day t operation of your system
  - A cornerstone in our systems management philosophy
  - Performance Management, Capacity Planning,

What are alerts?

- **Proactive monitoring can detect an abnormal situation before it causes trouble**
- **Continually analyzes customer defined conditions**
- **A condition can be**
  - Exceeding a certain threshold
  - An object in a state not conducive to proper operation
    - Volume offline
    - Virtual machine not logged on
    - Incorrect system settings

Where do alerts fit?



Alert architecture

- **A service virtual machine is used to execute the 'alert engine'**
  - The virtual machine wakes up every minute
  - Installation defined alerts are evaluated
  - Monitor data is extracted
  - Values returned compared against user defined thresholds
  - User defined messages are generated and stored in the DCSS
  - Notifications can be sent to interested parties

Alert samples

- **Alert samples are delivered with the package**
  - ALERT1 MONALERT is a generic set of samples
  - Older sample files are shipped with the filetype MONSAMP
    - VMALERT, LINALERT, HEALTH and HEALTH2
  - Samples ship with alerts to check various conditions that can potentially occur
    - LPAR, System, User, Linux node, Devices

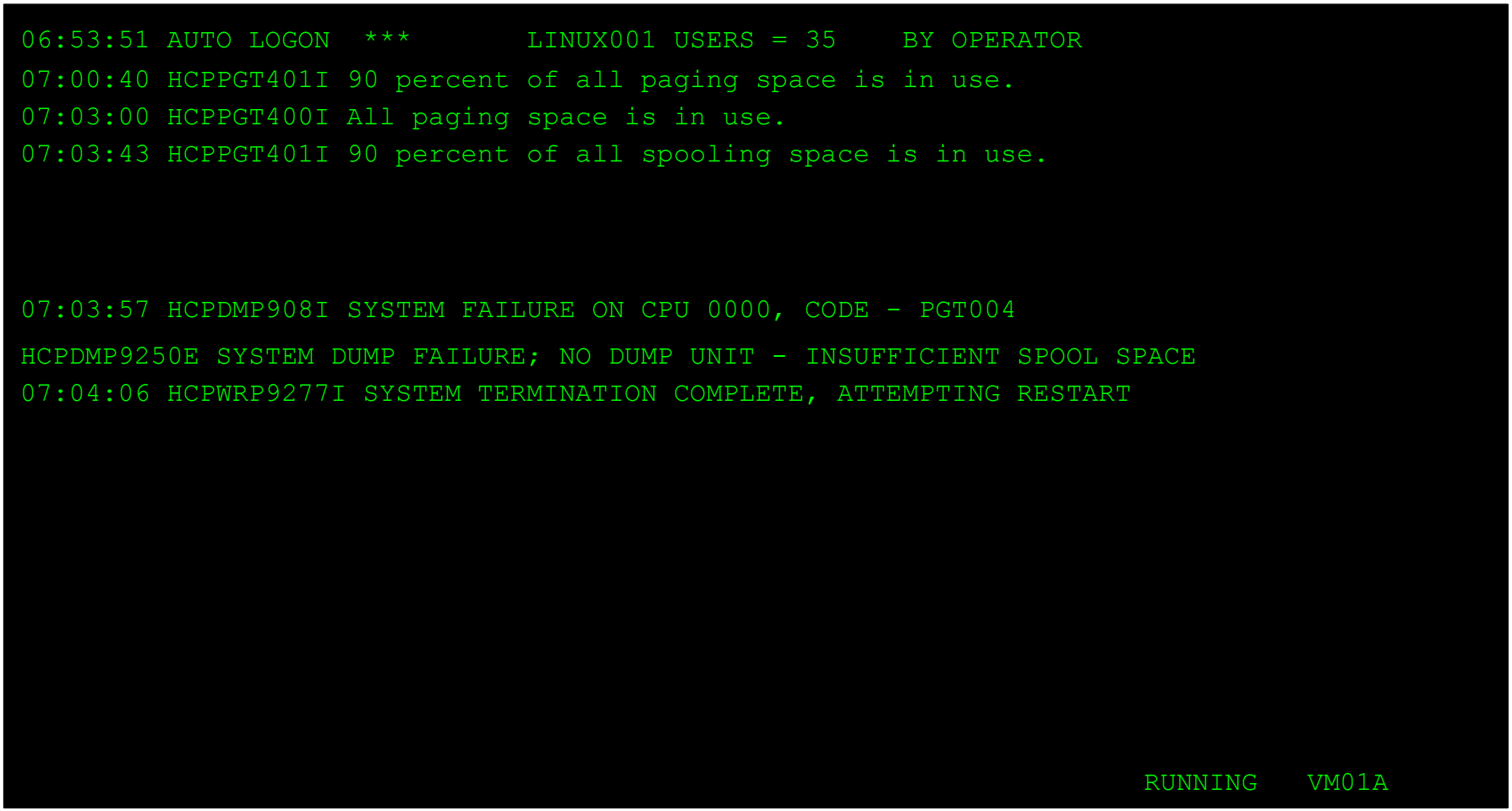
- **Additional samples available on our web site**

Notifications

- **A notification can be any of**
  - Message displayed via a 3270 session, zView or alert CGI
  - CP MSG to a user
  - Email to interested parties
    - Text message on a mobile device
  - SNMP trap sent to a management console
  - Combinations of the above

Defining your own alerts

- **Alerts generally use the following statements**
  - EXTRACT
    - Signifies the start of the data extract
  - CRITERIA
    - Provides a filter for data extracted from the monitor
  - VAR
    - Defines a local variable made up of an expression involving monitor variables
  - ALERT
    - Defines an alert on a variable defined in VAR
  - LEVEL
    - User defined thresholds and optional actions
  - TEXT


06:53:51 AUTO LOGON *** LINUX001 USERS = 35 BY OPERATOR
07:00:40 HCPPGT401I 90 percent of all paging space is in use.
07:03:00 HCPPGT400I All paging space is in use.
07:03:43 HCPPGT401I 90 percent of all spooling space is in use.
07:03:57 HCPDMP908I SYSTEM FAILURE ON CPU 0000, CODE - PGT004
HCPDMP9250E SYSTEM DUMP FAILURE; NO DUMP UNIT - INSUFFICIENT SPOOL SPACE
07:04:06 HCPWRP9277I SYSTEM TERMINATION COMPLETE, ATTEMPTING RESTART
RUNNING VM01A

Catastrophic event

- **Outages can have a large impact**
  - Unavailability of applications
  - Potential for information loss
  - Disruption of customer service
  - Political ramifications
    - Complex to manage
    - Outage makes the platform appear weak

Maintain availability

- **Critical to success**
- **Reduction or elimination of outages is vital**
- **A well maintained, highly-available system...**
  - Looks good to customers, end-users, shareholders

Defining your own alerts

```
07:00:40 HCPPGT401I 90 percent of all paging space is in use.
```

- **Alerts can help to detect this condition**
  - Before it degenerates into an abend and outage
- **Sample page space utilization alert**

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Defining your own alerts

'Extract' is the beginning of an alert definition or set of alert definitions

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Defining your own alerts

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Size of each variable with optional decimal precision

Variables defined for use in the following alerts

Defining your own alerts

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Fields to extract -
names are described in the PDR
(Performance Data Reference)

Can be a single field or multiple fields involved in simple to complex math operations.

Defining your own alerts

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Paging Data

SYTASG			SYTASG		
	SAMPLES	flt	=	flt 0	Observations
	CAL90FUL	flt	=	flt 1	Times paging area was 90 percent full
	CAL91FUL	flt	=	flt 1	Times spooling area was 90 percent full
	CALSLTA1	flt	=	flt 0	Paging slots allocated
	CALSLTI1	flt	=	flt 0	Paging slots in use

Defining your own alerts

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Four character code used when displaying alerts

ALERT statement defines a specific alert

Each alert requires a previously defined variable

Defining your own alerts

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text Page utilization is &pgutil%
```

Color of the alert text when this level is exceeded

Values tested against the alert variable

LEVEL statement controls the threshold values

Defining your own alerts

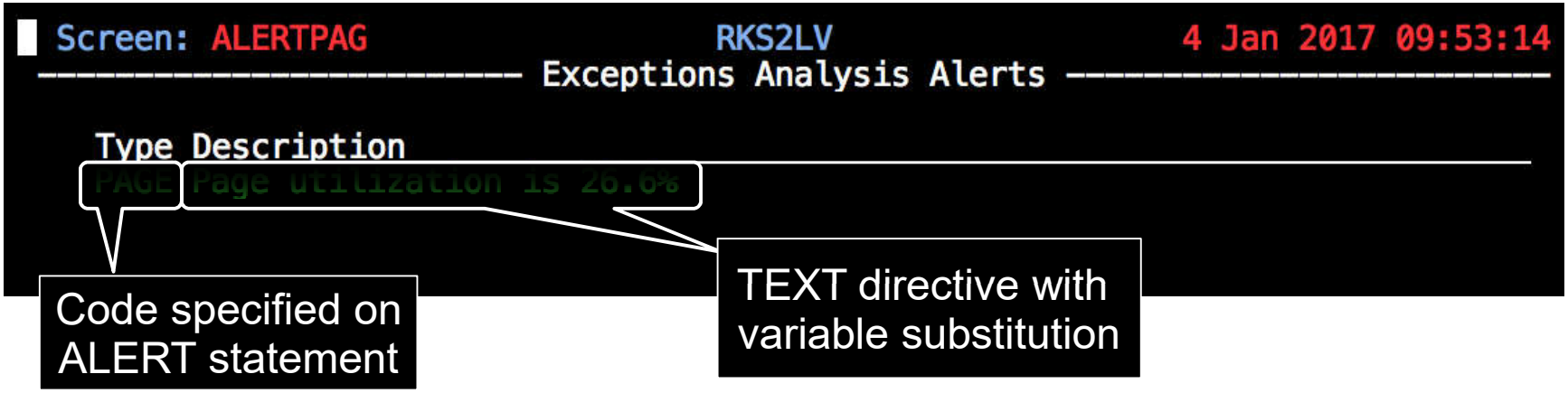
```
extract
var  pgutil   | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1

alert pgutil page
level 20 green
level 50 yellow
level 80 red
text  Page utilization is  &pgutil%
```

Alert variable substitution

Message displayed on 3270 and zView alert screens

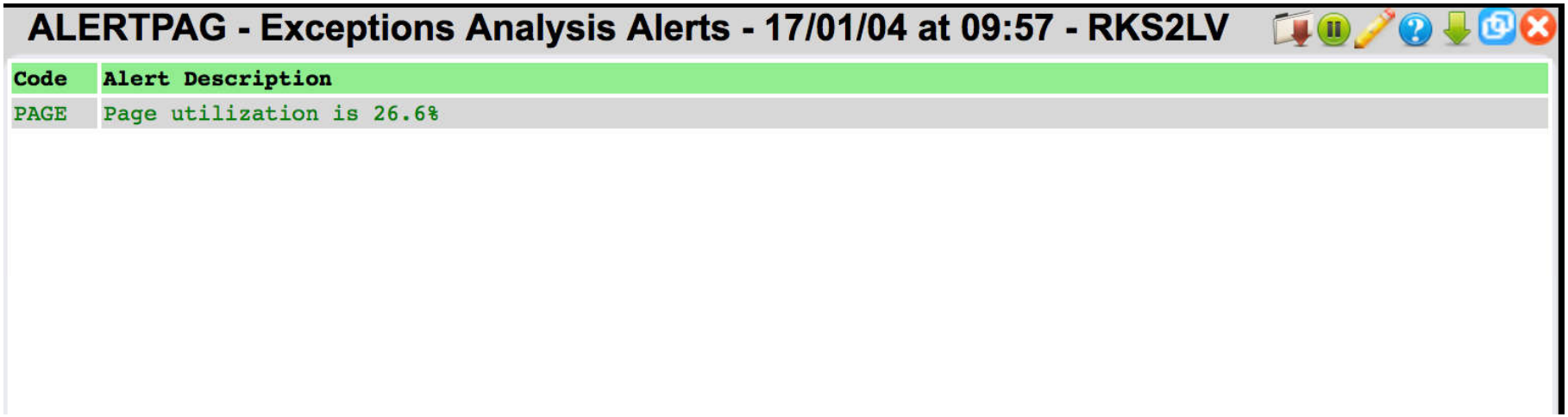
Alert result - 3270

- **The 3270 screen based on the alert definition**



Alert result - zView

- Same data in zView



Page and Spool Utilization combined

- **Some alerts can be combined under one extract**
  - Saves processing time
  - Needs to be similar data

```
extract
var  pgutil  | 3 1 | (sytasg.calslti1*100)/sytasg.calslta1
var  sputil  | 3 1 | (sytasg.calslti2*100)/sytasg.calslta2

alert pgutil page
level 20  green
level 50  yellow
level 80  red
text Page utilization is &pgutil%

alert sputil spol
level 20  green
level 50  yellow
level 80  red
text Spool utilization is &sputil%
```

```
Screen: PGSP                                RKS2LV
---------------------- Exceptions Analysis Alerts

  Type Description
  PAGE Page utilization is 26.0%
  SPOL Spool utilization is 61.2%
```

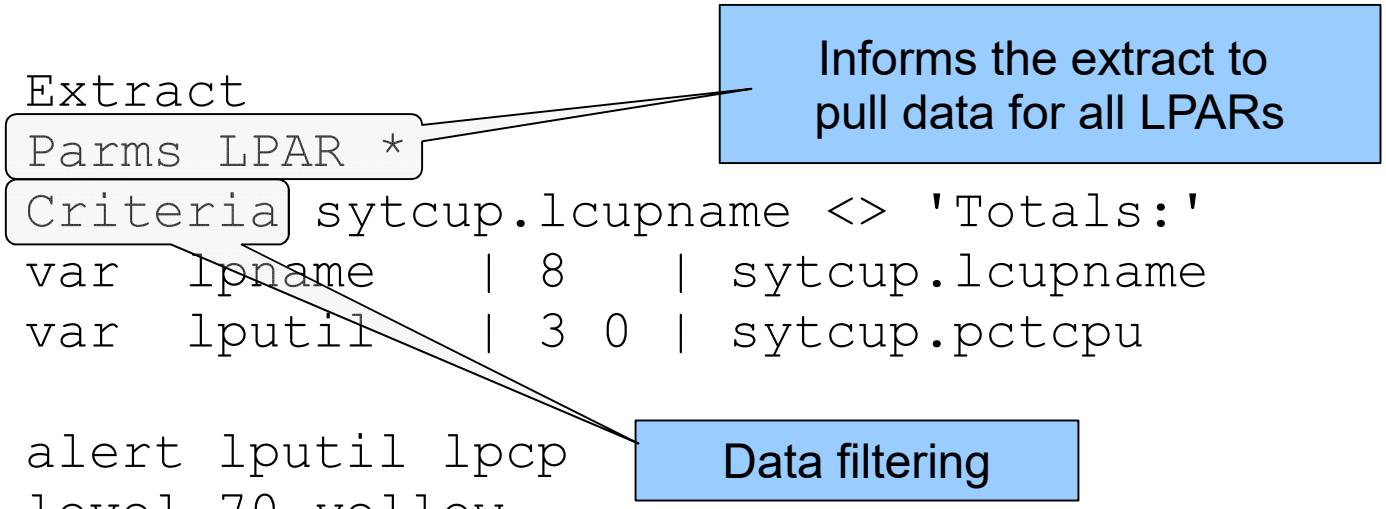
Alert rules

- **Adjust the number and value of levels based on local requirements**
  - At least one LEVEL statement is necessary
  - LEVEL statements are evaluated from the bottom up
- **Standard 3270 colors are allowed**
  - Turquoise, Blue, Red, Yellow, Green, Pink, White
  - If no color is specified, the default is Green
  - Color modifiers are allowed
    - **REV**video – reverse video
    - **BLI**nk – blink the entire text
    - **UNDERLINE** – underline the entire text

- **Alert for LPAR Utilization**

```
Extract
Parms LPAR *
Criteria sytcup.lcupname <> 'Totals:'
var  lpname    | 8    | sytcup.lcupname
var  lputil    | 3 0  | sytcup.pctcpu

alert lputil lpcp
level 70 yellow
level 85 red
level 95 red rev
text LPAR utilization of &lpname is &lputil%
```

- **Alert for LPAR Utilization**




```
Extract
Parms LPAR *
Criteria sytcup.lcupname <> 'Totals:'
var  lpname    | 8    | sytcup.lcupname
var  lputil    | 3 0  | sytcup.pctcpu

alert lputil lpcp
level 70 yellow
level 85 red
level 95 red rev
text LPAR utilization of &lpname is &lputil%
```

- **Alert for LPAR Utilization**

```
Extract
Parms LPAR *
Criteria sytcup.lcupname <> 'Totals:'
var  lpname    | 8    | sytcup.lcupname
var  lputil    | 3 0  | sytcup.pctcpu

alert lputil lpcp
level 70 yellow
level 85 red
level 95 red rev
text LPAR utilization of &lpname is &lputil%
```

Text will be in reverse video (black text, red background)

LPAR Utilization

- **Alert for LPAR Utilization display**

3270 →

```
Screen: ALERTLPR        Velocity Software - VSIVM5        4 Jan 2017 11:36:12
------------------------ Exceptions Analysis Alerts -------------------------

   Type Description
   LPCP LPAR VSIVM4 CPU Utilization is 78%
```

zView ↓

ALERTLPR - Exceptions Analysis Alerts - 17/01/04 at 11:36 - VM5

Code	Alert Description
LPCP	LPAR VSIVM4 CPU Utilization is 78%

External Processing

- **An alert can call an external process**
  - Function
  - Stage
- **Function is a REXX EXEC that processes already extracted data**
  - Called for each record returned from an extract
  - Returns a single value
- **Stage is an EXEC that is called as a pipeline stage**
  - Must have a filetype of REXX
  - Can independently run it's own extract
  - Returns a single value

Engine Utilization

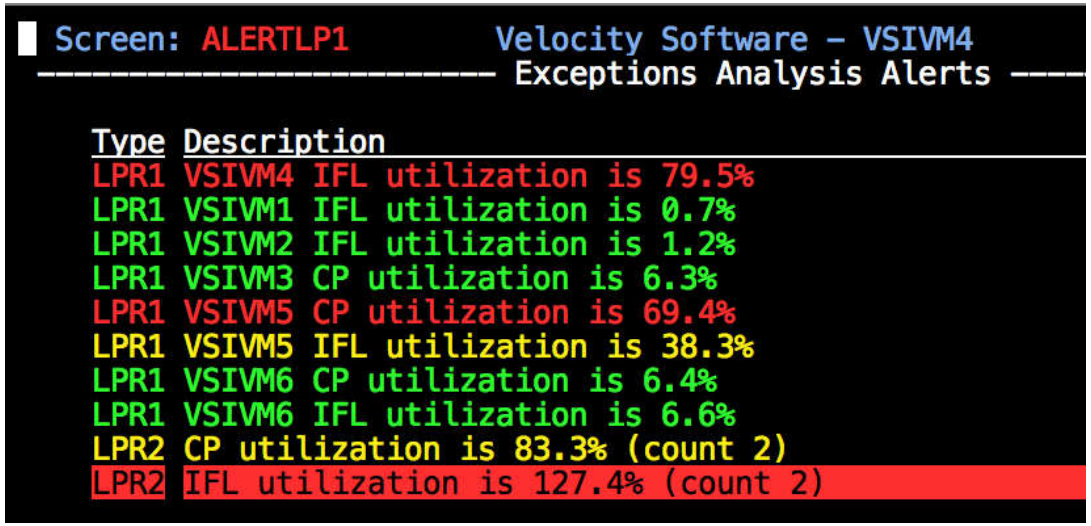
```
Extract
Parms LPAR *
Criteria sytcup.lcupname <> 'Totals:'

var lparname | 8    | sytcup.lcupname
var lparcpu  | 3 1  | sytcup.lcucactm / 10000 / sytcup.lcutctod
var calflgs  | 3    | sytcup.calflgs
function cputype  | 4 | &calflgs

alert lparcpu lpr1
level  0 green
level 30 yellow
level 50 red
text &lparname &cputype utilization is &lparcpu%



Extract
Parms CPU Totals

var cptype    | 8    | lparnw.cptype
var cpcount   | 3    | lparnw.cpcnt
var cppct     | 5 1  | lparnw.totalpct

alert cppct   lpr2
level  0  green
level 70  yellow
level 90  red
level 95  red rev
text &cptype utilization is &cppct% (count &cpcount)
```

FUNCTION or STAGE defines the name of the routine and becomes the value of the local variable returned

Engine Utilization

```
Extract
Parms LPAR *
Criteria sytcup.lcupname <> 'Totals:'

var lparname | 8    | sytcup.lcupname
var lparcpu  | 3 1  | sytcup.lcucactm / 10000 / sytcup.lcutctod
var calflgs  | 3    | sytcup.calflgs
function cputype  | 4 | &calflgs

alert lparcpu lpr1
level  0 green
level 30 yellow
level 50 red
text &lparname &cputype utilization is &lparcpu%
```

```
Extract
Parms CPU Totals

var cptype    | 8    | lparnw.cptype
var cpcount   | 3    | lparnw.cpcnt
var cppct     | 5 1  | lparnw.totalpct

alert cppct   lpr2
level  0  green
level 70  yellow
level 90  red
level 95  red rev
text &cptype utilization is &cppct% (count &cpcount)
```



Second vdisk usage

- **Using two swap disks with different priority**
  - Second disk larger than the first
  - First disk fills, Linux uses the second disk
  - Alert when second disk is used

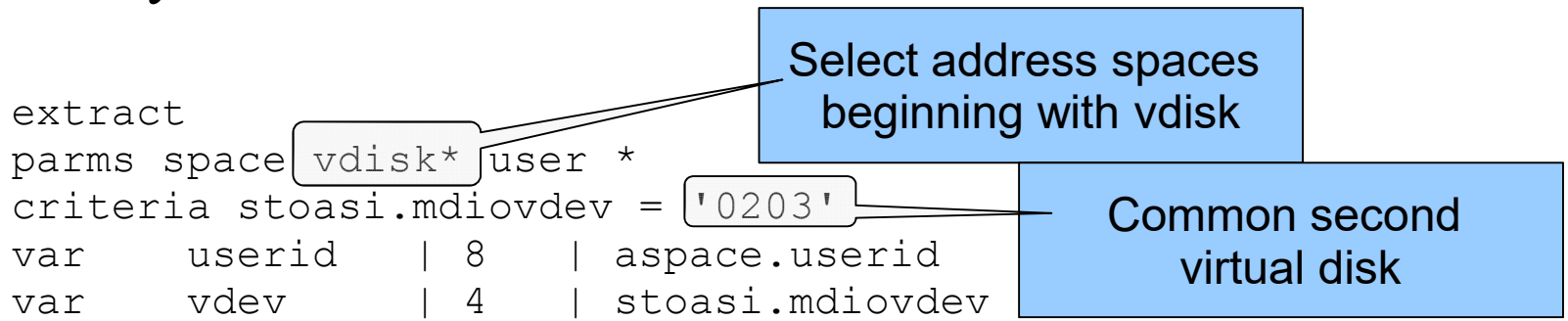
ESAVDSK - VDISK Analysis - RKS2LV

Time	Owner	Space Name	<--Size---> AddSpc Pages	VDSK Blks	<--pages--> Resi- dent	Lock- ed	Prv or Shr	VIO rate /min	Usr Lks	<AddSpce> Cre- ates	Del- etes	<----------pages/s Sto- len	<--DASD---> Read	Write
07:56:00	LINUX001	VDISK$LINUX001$0202$0031	4000	32000	407	0	Shr	311	1	0	0	41.2	48.0	38.6
07:56:00	LINUX001	VDISK$LINUX001$0203$0032	16000	128K	8093	0	Shr	845	1	0	0	37.6	172.5	36.6
07:56:00	LINUX002	VDISK$LINUX002$0202$0053	4000	32000	0	0	Shr	0	1	0	0	0	0	0

Vdisk activity indicator

Second vdisk usage

- **Create an alert to show Vdisk activity**
  - Only care about the second disk




```
extract
parms space vdisk* user *
criteria stoasi.mdiovdev = '0203'
var    userid    | 8    | aspace.userid
var    vdev      | 4    | stoasi.mdiovdev
var    io_rate   | 6    | stoasi.qdiiocnt

alert io_rate lsvd
level 0 red
text Node &userid is using the second virtual disk
```

Second vdisk usage

- **Result**

```
extract
parms space vdisk* user *
criteria stoasi.mdiovdev = '0203'
var    userid    | 8    | aspace.userid
var    vdev      | 4    | stoasi.mdiovdev
var    io_rate   | 6    | stoasi.qdiiocnt

alert io_rate lsvd
level 0 red
text Node &userid is using the second virtual disk
```

```
Screen: LSVD                                RKS2LV
------------------------ Exceptions Analysis Alerts ----

  Type Description
  LSVD Node LINUX001 is using the second virtual disk
```

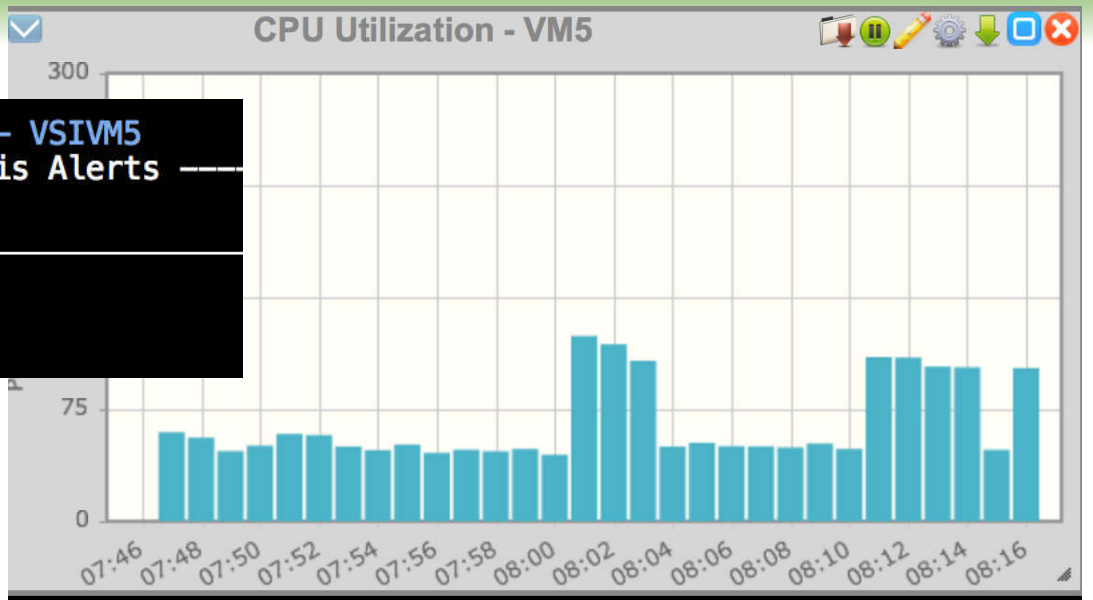
VM CPU Utilization and Paging Rate

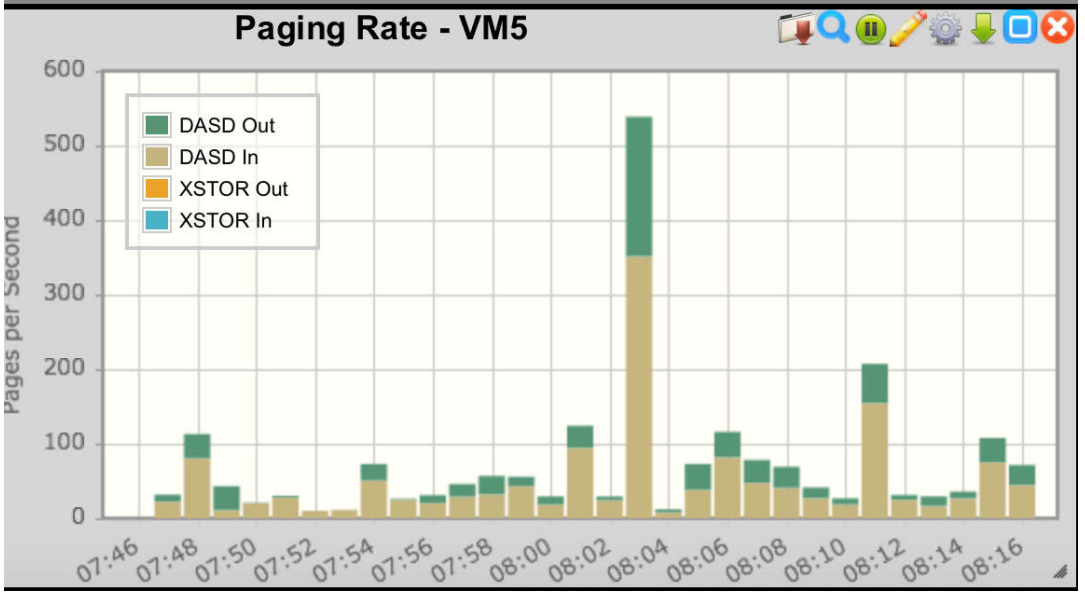
- CPU Utilization can be normalized or totaled
- Paging rate indicates storage activity and pressure

```
extract
Parms CPU TOTAL

var util    | 5 1 | sytprp.cpuutil
var syspgrt | 6 0 | sytsyp.plspiopw + sytsyp.plspiopr

alert util xacp
level 20 green
level 50 yellow
level 90 red
text Processor utilization at &util%

alert syspgrt pgrt
level 05 green
level 10 yellow
level 30 red
text System paging rate &syspgrt
```

VM CPU Utilization and Paging Rate

```
Screen: XACP            Velocity Software - VSIVM5
------------------------ Exceptions Analysis Alerts ----

  Type Description
  PGRT System paging rate 77
  XACP Processor utilization at 107.8%
```





VELOCITY SOFTWARE

Missing Virtual Machine

- **Detection mechanism for required virtual machines**
  - Service machines
  - Utility machines
  - Linux systems

```
extract
var   dummy     | 1 | 1
stage alrtmusr | 8 |

alert dummy  xmvm
level 0 red action CP MSG OP &code &atext
text User &alrtmusr not logged onto system
```

```
Screen: TOP20                          RKS2LV
------------------------- Exceptions Analysis Alerts ------

   Type Description
   XMVM User ZWEB06 not logged onto system
```

MISSING USER

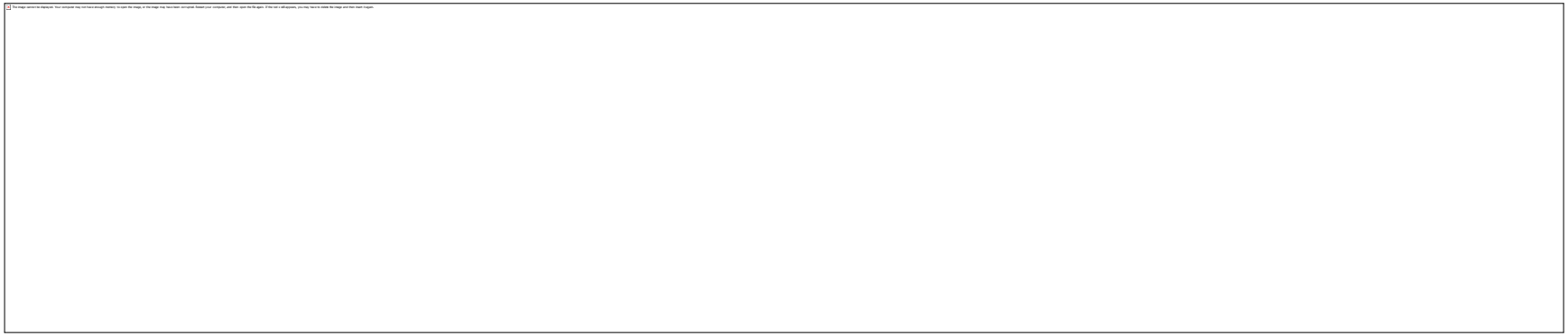
```
/* VELOCITY Virtual Machines
ZSERVE ZTCP
ZADMIN ZWEB01 ZWEB02 ZWEB03
ZWEB04 ZWEB05 ZWEBLOG
ZWEB06
/*
/*     SFS service machines
/*
VMSERVU VMSERVS SFSZVPS
/*
CRON
```

Channel path utilization

- **Channel is the interface to the outside world**
  - Disk devices
  - Network devices
  - Cross LPAR communication
- **High utilization**
  - Additional paths required
  - Error conditions

Channel path utilization

```
extract
parms channel 00-ff
criteria sytepm.chpid >= 00
var  chpid   | 2   | sytepm.chpid
var  cclass  | 8   | sytepm.chanclass
var  totutil | 3 1 | sytepm.pctchpbusy

alert totutil cutl
level   0 blue
level  20 yellow
level  50 red
text Channel &chpid (&cclass) utilization &totutil%
```



User level conditions

- **User usage of the following resources**
  - User CPU
  - User Paging
  - User I/O
- **Loop detection**

User level conditions

```
extract
parms user *
criteria userdata.userid <> 'System:' & useact.vmdttime > 0
var userid      | 8   | userdata.userid
var cpuutil     | 3 1 | useact.vmdttime * 100 / RUNTIME
var io_rate     | 6 0 | (useact.vmdvdsct+useact.vmdvosct-
                        +useact.vmdvcsct+useact.vmdvusct-
                        +useact.vmdvtsct)/runtime
var page_rate   | 6   | (useact.vmdctpgr+useact.vmdctpgw)/runtime
var userprt     | 8   | useact.vmdctpgr
var looper      | 4   | userdata.tuner3

alert cpuutil vmcp
level  5 green
level 15 yellow
level 50 red
text User &userid utilization is &cpuutil%

alert userprt vmpg
level 50  green
level 100 yellow
level 250 red
text Page rate for user &userid &userprt

alert io_rate  vmio
level  5 green
level 30 yellow
level 50 red
text I/O rate for user &userid &io_rate

alert looper vmlp
level  5 red
text User &userid may be looping: CPU loop count &looper
```

User level conditions

```
extract
parms user *
criteria userdata.userid <> 'System:' & us
var userid      | 8    | userdata.userid
var cpuutil     | 3 1  | useact.vmdttime * 1
var io_rate     | 6 0  | (useact.vmdvdsct+us
                         +useact.vmdvcsct+us
                         +useact.vmdvtsct)/r
var page_rate   | 6    | (useact.vmdctpgr+us
var userprt     | 8    | useact.vmdctpgr
var looper      | 4    | userdata.tuner3

alert cpuutil vmcp
level  5 green
level 15 yellow
level 50 red
text User &userid utilization is &cpuutil%

alert userprt vmpg
level 50  green
level 100 yellow
level 250 red
text Page rate for user &userid &userprt

alert io_rate  vmio
level  5 green
level 30 yellow
level 50 red
text I/O rate for user &userid &io_rate

alert looper vmlp
level  5 red
text User &userid may be looping: CPU loop count &looper
```

```
Screen: USER          Velocity Software - VSIVM5
---------------------- Exceptions Analysis Alerts --

 Type Description
 VMCP User XCAT utilization is 47.5%
 VMCP User ZVSE43 utilization is 44.7%
 VMCP User ZVSE51 utilization is 12.3%
 VMIO I/O rate for user ZSERVE 6
 VMIO I/O rate for user ZVSE43 183
 VMIO I/O rate for user ZVSE51 88
 VMIO I/O rate for user ZVSE52 13
 VMLP User XCAT may be looping: CPU loop count 2092
 VMLP User ZVSE43 may be looping: CPU loop count 1
 VMPG Page rate for user LOHCOST 68
 VMPG Page rate for user LXORA12 167
 VMPG Page rate for user REDHAT5 275
 VMPG Page rate for user XCAT 1249
 VMPG Page rate for user ZVSE43 806
 VMPG Page rate for user ZVSE51 4286
 VMPG Page rate for user ZVSE52 197
```

Wait states

- **A condition that causes a virtual machine to delay processing**
- **When a virtual machine waits, it can not do useful work**
  - Simulation wait – waiting for simulation functions
    - Master processor, IUCV, RPI, line mode commands
  - Page wait – waiting for page fault resolution
  - CPU wait – waiting for CPU

Wait states

```
extract
parms user *
criteria userdata.userid <> 'System:' & useact.vmdttime > 0
var userid      | 8    | userdata.userid
var simwtpct    | 3 0  | (useint.hfsimwt*100)/useint.nondorm
var cpuwtpct    | 3 0  | (useint.hfcpuwt*100)/useint.nondorm
var pagwtpct    | 3 0  | (useint.hfwtpag*100)/useint.nondorm

alert simwtpct vmsw
level  0 blue
level 10 blue
level 20 yellow
level 50 red
text User &userid is in &simwtpct% simulation wait

alert cpuwtpct vmcw
level  0 blue
level 10 blue
level 20 yellow
level 50 red
text User &userid is in &cpuwtpct% CPU wait

alert pagwtpct vmpw
level  0 blue
level 10 blue
level 20 yellow
level 50 red
text User &userid is in &pagwtpct% page wait
```

Wait states

```
extract
parms user *
criteria userdata.userid <> 'System:' & useact.vmdttime > 0
var userid      | 8    | userdata.userid
var simwtpct    | 3 0  | (useint.hfsimwt*100)/useint.nondorm
var cpuwtpct    | 3 0  | (useint.hfcpuwt*100)/useint.nondorm
var pagwtpct    | 3 0  | (useint.hfwtpag*100)/useint.nondorm

alert simwtpct vmsw
level  0 blue
level 10 blue
level 20 yellow
level 50 red
text User &userid is in &simwtpct% simulation wait

alert cpuwtpct vmcw
level  0 blue
level 10 blue
level 20 yellow
level 50 red
text User &userid is in &cpuwtpct% CPU wait

alert pagwtpct vmpw
level  0 blue
level 10 blue
level 20 yellow
level 50 red
text User &userid is in &pagwtpct% page wait
```

```
Screen: WAITS                                RKS2LV
---------------------- Exceptions Analysis Alerts

 Type Description
 VMCW User LINUX002 is in 5% CPU wait
 VMPW User LINUX002 is in 5% page wait
 VMPW User RKSDEV is in 100% page wait
 VMPW User SFSZVPS is in 33% page wait
 VMPW User ZWRITE is in 20% page wait
 VMSW User DATAMOVE is in 100% simulation wait
 VMSW User ZADMIN is in 100% simulation wait
```

Linux data

- **Linux statistics are collected via SNMP**
- **Integrated into the monitor by ZTCP**

- **Node utilization**
  - CPU Utilization reported for each node
- **Process utilization**
  - CPU Utilization of each process running on a node

Node and process utilization

```
extract
parms node *
criteria ucdsys.totcpu > 0
var node    | 8   | tcpip.node
var cpuutil | 4 1 | ucdsys.systpct + ucdsys.userpct

alert cpuutil lncp
level  5  green
level 50  yellow
level 90  red
text CPU utilization on node &node is &cpuutil%

extract
parms node *
criteria vsisft.name <> '*Totals*'
var node     | 8   | tcpip.node
var name     | 8   | vsisft.name
var pid      | 8   | vsisft.id
var procutil | 4 2 | vsisft.totcpupct

alert procutil lnpu
level 10 yellow
level 50 red
text Process utilization for &name-&pid on &node is &procutil%
```

Node and process utilization

```
extract
parms node *
criteria ucdsys.totcpu > 0
var node     | 8    | tcpip.node
var cpuutil | 4 1 | ucdsys.systpct + ucdsys.userpct

alert cpuutil lncp
level  5  green
level 50  yellow
level 90  red
text CPU utilization on node

extract
parms node *
criteria vsisft.name <> '*To
var node     | 8    | tcpip.n
var name     | 8    | vsisft.
var pid      | 8    | vsisft.
var procutil | 4 2 | vsisft.

alert procutil lnpu
level 10 yellow
level 50 red
text Process utilization for &name-&pid on &node is &procutil%
```

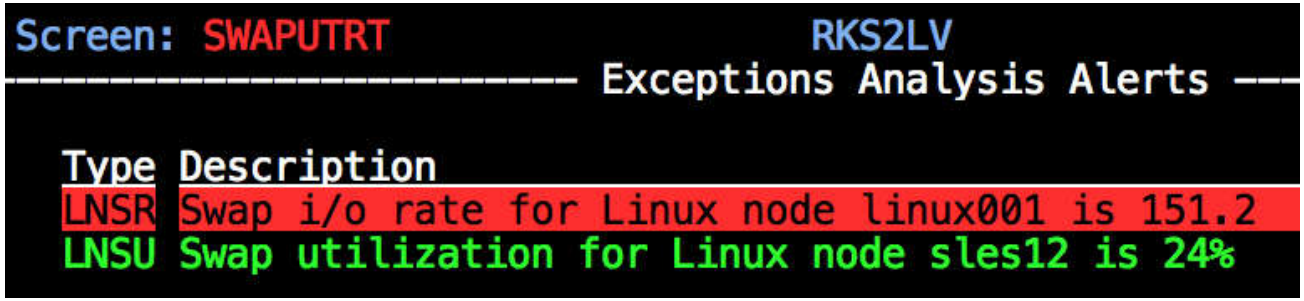
```
Screen: NODEPRCS        Velocity Software - VSIVM4        5 Jan 2
------------------------ Exceptions Analysis Alerts -------------

 Type Description
 LNCP CPU utilization on node mail is 39.0%
 LNCP CPU utilization on node rksctnr1 is 24.3%
 LNCP CPU utilization on node rksctnr2 is 23.4%
 LNCP CPU utilization on node rksctnr3 is 25.1%
 LNCP CPU utilization on node sles12 is 24.2%
 LNCP CPU utilization on node vpnc is 5.2%
 LNPU Process utilization for stresser-28 on rksctnr1 is 11.22%
 LNPU Process utilization for stresser-28 on rksctnr2 is 11.79%
 LNPU Process utilization for stresser-2795 on sles12 is 11.10%
 LNPU Process utilization for stresser-3168 on sles12 is 11.78%
```

Swap utilization and rate

- **Swap utilization**
  - How much swap are we using?
- **Swap rate**
  - Are we swapping now?

Swap utilization and rate

```
extract
parms node *
criteria ucdsys.swappct > 0
var    node      | 8    | tcpip.node
var    swaprate  | 6 1  | ucdsys.swaprate
var    swapused  | 4 0  | ucdsys.swappct

alert swaprate lnsr
level 50  red rev
text Swap i/o rate for Linux node &node is &swaprate

alert swapused lnsu
Level 20  green
level 50  yellow
level 90  red rev
text Swap utilization for Linux node &node is &swapused%
```



Node down/Reboot detection

- **An indication that a Linux system is unresponsive**
  - Could be snmp down
  - Could be a connection problem
  - More likely a Linux problem

- **Let interested parties know when a reboot occurred**
  - Intentional or not...

Node down/Reboot detection

```
extract
parms node *
criteria hstsys.iplyy => 0
var node     | 8    | tcpsys.node
var ipaddr   | 15   | tcpsys.ipaddress
var hsamp    | 1    | hstsys.samples
var upmins   | 9 0  | (hstsys.sysuptime / 6000)

alert hsamp lxdn | count &node
level =0 red
text Node &node (&ipaddr) is down (&tcount intervals)

alert upmins lxrb
level <5 green
text Node &node (&ipaddr) has been rebooted (up &upmins min)
```

```
Screen: LXDN                          RKS2LY                  26 Jul 2016 07:35:13
----------------------- Exceptions Analysis Alerts -----------------------

  Type Description
  LXDN Node linux001 (192.168.5.183) is down (1 intervals)
```

```
Screen: LXDN                          RKS2LY                  26 Jul 2016 07:39:14
----------------------- Exceptions Analysis Alerts -----------------------

  Type Description
  LXRB Node linux001 (192.168.5.183) has recently been rebooted (up 2 min)
```

Notifications

- **A notification is a message sent to interested parties of an alert condition**
- **Sent in one or more of the following forms**
  - CP MSG/MSGNOH
  - Email
  - Text page (via email)
  - SNMP Trap

Notifications

- **At it's simplest a notification can take the form of a message to a CMS user**

```
alert userprt vmpg | count &userid
level   5 green action CP MSG OP &code &atext
text Page rate for &userid is &userprt/sec (above &tlevel for &tcount)
```

ACTION keyword on the LEVEL statement allows targeted messaging for a specific threshold

```
09:25:10 ZALERT   VMPG Page rate for TCPIP has recovered, now 0.2
09:27:10 ZALERT   VMPG Page rate for OPERATOR is 6.8/sec (above 5 for 6)
```

- **SNMP Trap configuration**
  - Create/Modify SNMP TRAPDEST on the CONFIG disk

```
* following is default 1.3.6.1.4.1.15601
192.168.5.182 velocity 2B06010401F971 ;
```

  - Use the TRAP directive on the LEVEL command

```
alert spool_use spol
level 10 green
level 70 yellow trap &code &atext
level 80 pink
level 90 red
text Spool utilization is &spool_use% (above &tlevel)
```

Notifications

- **SNMP Trap result**

```
Screen: RKS2LV                    RKS2LV                    6
------------------------ Exceptions Analysis Alerts ---------

  Type Description
  APSP Page space is 26.51% used
  DVRT I/O rate for volume VM5W01 0124 103.35/sec
  DVRT I/O rate for volume VM5PG1 0127 7.72/sec
  ESAD ESAMON DCSS utilization is 3.3%
  LNCP CPU utilization on Linux node sles12 is 22.66%
  LNDX /usr area on linux001 is 86.65% full
  LNDX /usr area on linux002 is 86.65% full
  LNDX /var area on linux002 is 88.36% full
  LNPU Process stresser CPU usage on node sles12 is 20.65%
  LNSU Swap utilization for Linux node sles12 is 24%
  PGRT System paging rate 48 (above 5)
  SPOL Spool utilization is 72% (above 70)
  VMCP User ZVPS is at 1.8807%
  VMC2 User RKSDEV used 0.0018 CPU sec (0.0030%)
  VMC2 User ZALERT used 0.2047 CPU sec (0.3412%)
  VMIO I/O rate for user SFSZVPS 17
  VMPG Page rate for OPERATOR is 6.9/sec (above 5 for 5)
  VMPG Page rate for SMTP is 5.5/sec (above 5 for 1)
  VMPG Page rate for ZALERT is 10.6/sec (above 5 for 1)
  XACP Processor utilization at 3.1%
```

▼ ID	Severity	Time	Node	Interface
217	Normal ⊞⊟	Jan 6, 2017 9:41:00 AM ◧◨		192.168.5.48 ⊞⊟
		uei.opennms.org/generic/traps/EnterpriseDefault ⊞⊟ Edit notifications for event		
		Trap from 192.168.5.48 Type: 0 Message: SPOL Spool utilization is 72% (above 70)		

Too many notifications!

```
alert spool_use spol
level 10 green
level 70 yellow action cp msg zvps &code &atext
level 80 pink
level 90 red
text Spool utilization is &spool_use% (above &tlevel)
```

```
10:41:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:42:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:43:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:44:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:45:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:46:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:47:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:48:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:49:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:50:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:51:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:52:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:53:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:54:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
10:55:11  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
```

Too many notifications!

- **The LIMIT directive delays an ACTION for the specified number of intervals**

```
alert spool_use spol
limit 4 1 | &serial
level 10 green
level 70 yellow action cp msg zvps &code &atext
level 80 pink
level 90 red
text Spool utilization is &spool_use% (above &tlevel)
```

Key field

Number of intervals to delay executing ACTION

After the delay, number of intervals TO execute ACTION (default is 1)

Too many notifications!

- **This LIMIT directive:**

```
limit 4 1 | &serial
```

- **Will delay ACTION for 4 intervals**
- **Execute ACTION on the next interval for 1 interval**
- **Repeat**

```
11:02:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:07:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:12:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:17:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:22:11  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:27:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:32:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:37:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:42:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:47:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:52:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
11:57:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
12:02:10  * MSG FROM ZALERT  : SPOL Spool utilization is 72% (above 70)
```

Advanced topics – Include/Exclude

- **If an alert is required to show nodes that don't fit into a wildcard**
  - An include or exclude must be used

```
extract
parms node *
criteria ucdsys.swappct > 0
var    node      | 8    | tcpip.node
var    swapused | 4 0 | ucdsys.swappct

alert swapused lnsu
include node sub1
level 01  green
level 50  yellow
level 80  pink
level 90  red rev
text Swap utilization for Linux node &node is &swapused%
```

<filename> IXLIST

```
-SUB1-
linux93
sles11v
redhat5x
-END SUB1-
```

Advanced topics – Include/Exclude

- **If an alert is required to show nodes that don't fit into a wildcard**
  - An include or exclude must be used

```
extract
parms node *
criteria ucdsys.swappct > 0
var     node      | 8    | tcpip.node
var     swapused  | 4  0 | ucdsys.swappct

alert swapused lnsu
include node sub1
level 01   green
level 50   yellow
level 80   pink
level 90   red rev
text Swap utilization for Linux node &node is &swapused%
```

<filename> IXLIST

```
-SUB1-
linux93
sles11v
redhat5x
-END SUB1-
```

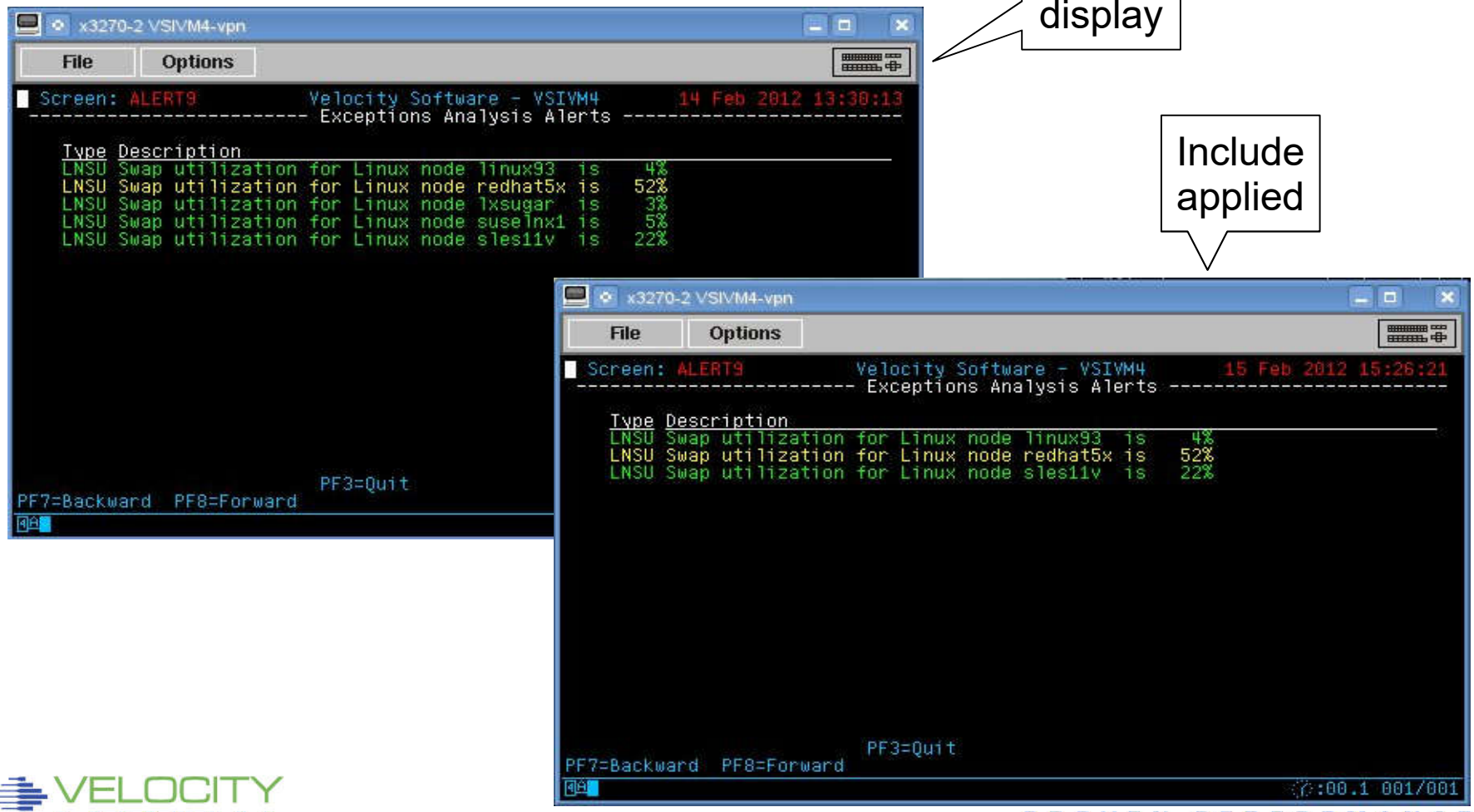
Variable used for matching

Include/Exclude file name must match the alert file name

List name applied to alert

Advanced topics – Include/Exclude

- **Results of Include file**



Updates in 4300

- **Due to a change in ZMON**
  - HSTMEM.DESC is now 60 bytes
  - An alert that contains:

```
var desc     | 32   | hstmem.desc||hstmem.descr
```

  - Should now contain:

```
var desc     | 60   | hstmem.desc
```

Updates in 4300

- **Alert recovery support**
  - After an action is executed for an exceeded threshold, an additional action can be when the threshold is no longer exceeded
- **Include/Exclude lists now support CMS wildcards**
  - % for any single arbitrary character
  - * for a group of characters before or after
- **%INCLUDE support**
  - Allows additional alert files to be brought in
- **Invalid alert variables are now flagged**

Summary

- Proactive monitoring can watch the system
- Notifications can be delivered for more critical issues
- Management consoles fit this mechanism perfectly
- Many useful samples are provided

Questions

Rich Smrcina
Velocity Software, Inc
rich@velocitysoftware.com