Automated Performance Management Advice Using Computational Intelligence

#34

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Performance Management

- **Measurement**
  - Monitor present behaviour
  - Alarms & alerts
- **Analysis**
  - Analyze past behaviour
  - Bottlenecks, trends & advice
- **Planning**
  - Predict future behaviour
  - Analytical models & scenarios

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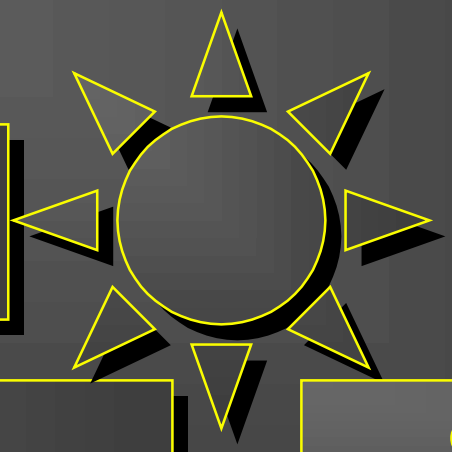
Computational Intelligence

- **Artificial intelligence**
  - Perhaps better thought of as “Synthetic”
- **Expert systems/ KBIS**
  - Rule base + inference engine
- **Knowledge base for Machines**
  - Rules, Examples, Models
- **Advice systems**
  - Stats, correlations, patterns, significance

Advice



Stats
Peaks, correlations

Domains
Oracle, Sybase, SAP

Simulation
Memory & Cache/ Batch

Neural Net
WL Growth/ Alert Thresholds

KBIS
Results interpretation

Expert
Shadow/Cluster/ Dynamic share

Stats/KBIS
Best peak period window selection

Health Check
Bottleneck analysis

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Metron's ATHENE V1.0 Decision Support

Component	Type	Required Resp.Time <secs>	Desirable Resp.Time <secs>	Baseline Resp.Time <secs>	Projected Response Times 1 ONE	2 TWO
SYSTEM	tp	-	-	0.05	0.05	0.05
SPOOLERS	tp	-	-	0.44	0.44	0.44
TP1	tp	0.80	0.70	0.64	0.70	0.80
TP2	tp	4.50	4.00	2.25	2.56	3.20
BATCH	ba	725.00	700.00	574.10	624.15	682.91

Explanation of Causes

Increase in arrival rate of TP1 affected
- Itself by increasing:
  - Queueing at the CPU by 10.05%
  - Queueing at DA20 by 23.11%
  - Queueing at DA22 by 17.85%
- TP2 by increasing:
  - Queueing at the CPU by 14.28%
  - Queueing at DA20 by 21.94%
  - Queueing at DA22 by 19.58%

Increase in MPL of BATCH affected
- Itself by increasing:
  - Queueing at DA23 by 9.42%

Summary of Recommendations

1 Move 100% of the I/O generated by TP1 from DA20 to DA21 to reduce:
  Queueing at DA20, reducing the response time of itself and TP2
2 Move 100% of the I/O generated by TP2 from DA22 to DA12 to reduce:
  Queueing at DA22, reducing the response time of itself, TP1 and BATCH
3 Upgrade the CPU from 3980 to SX450-10 to reduce:
  Busy time at the CPU, reducing the response time of TP1, TP2 and BATCH

This expensive operation is only necessary if you feel that the response time of BATCH really must be better than within 5% of the target.

Benefits of Recommendations

Workloads that Exceeded Targets	Target Response <s>	Excess Response <s>	New Response <s>	% Reduction of Excess Response
TP1	0.70	0.40	0.67	107.5
TP2	4.00	1.28	3.18	164.1
BATCH	700.00	62.70	718.29	70.8

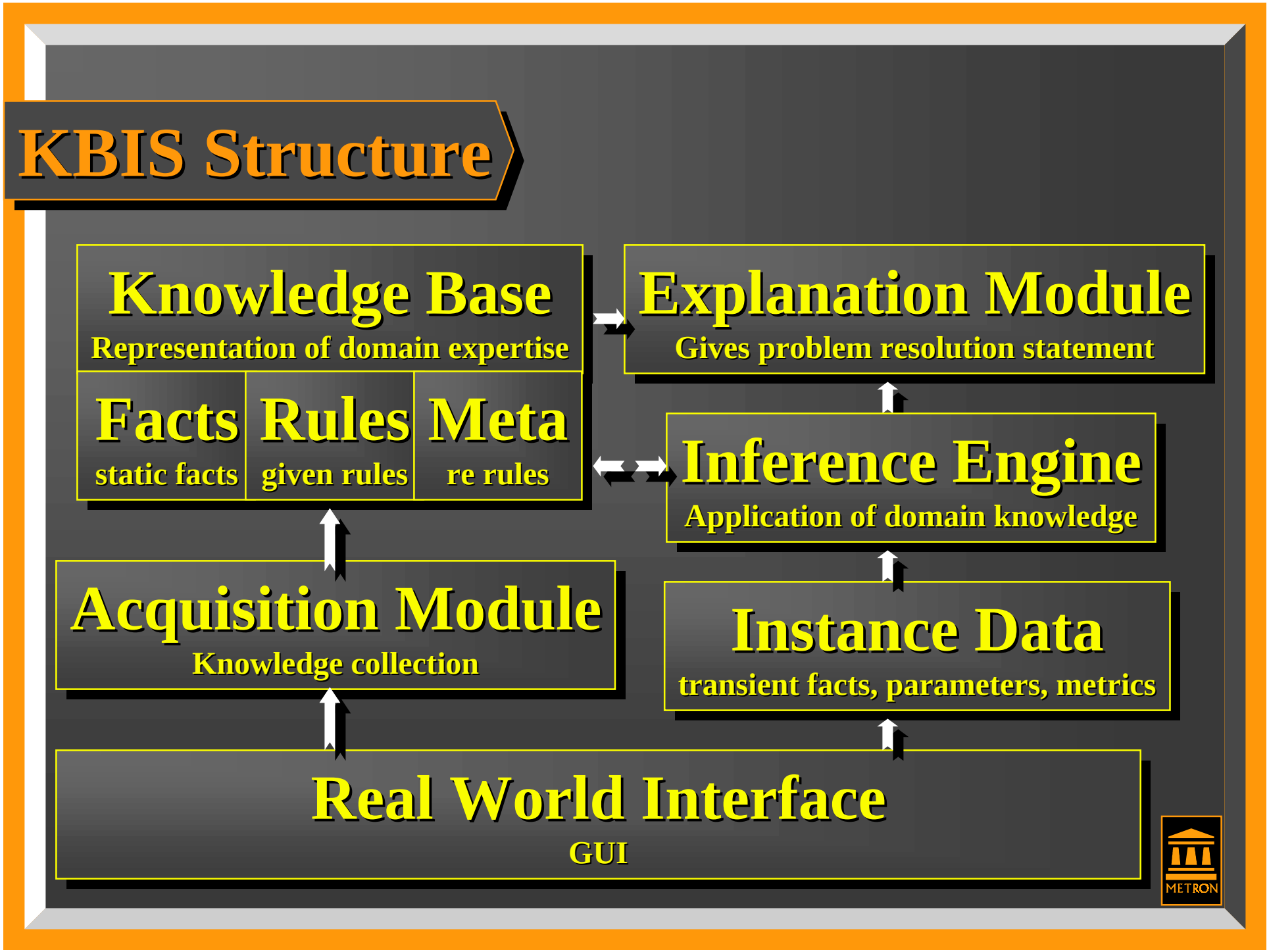
Metron's PERSEUS 8.00 TP Message

Application : IND1TLM3
Message Pair : E-ADD-A Type: Query

Data Description	User/Default Values
Significance	H
Multiphase	Y
Computing Intensity	H
Programming Language	COBOL
Av.Day Think/Type Time (s)	30
Av.Day Message Pairs/Hr	1
Av.Day No. Active Terminals	1
Av.Day Desired Response (s)	0.5
Av.Day Maximum Response (s)	1.0
Av.Day Interval (s)	3600

Time (s)	30
irs/Hr	8
Terminals	1
sponse (s)	1.0
Pk.Day Maximum Response (s)	2.0
Pk.Day Interval (s)	450
Conv.I/O Logical Reads	0
Conv.I/O Logical Writes	0
Conv.I/O CAFS searches	1
IDMS I/O Keyed Find/Obtain	0
IDMS I/O Keyed Store	0
IDMS I/O Keyed Modify	0
IDMS I/O via Find First	0
IDMS I/O via Oth Find/Obtain	0
IDMS I/O via Store	0
IDMS I/O via Modify	0
IDMS I/O via Erase	0
IDMS I/O via Connect/Disconn	0
IDMS I/O CAFS Searches	0
Total DML statements obeyed	0

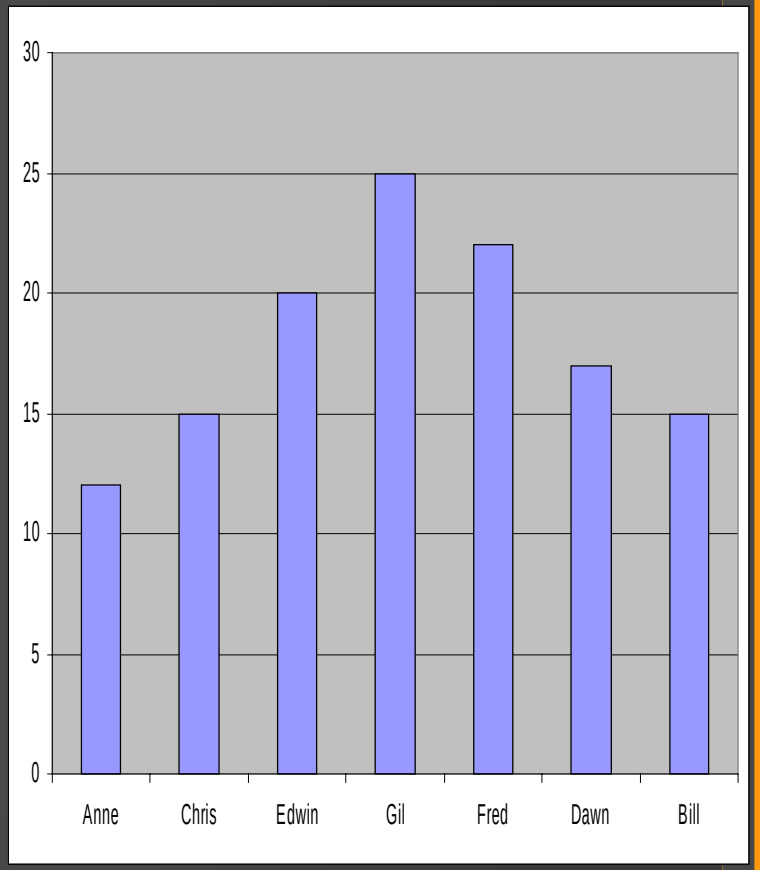
KBIS Structure



Knowledge Base for Machine Learning

- **Rote**
  - spoon-fed correct decisions
- **Advice**
  - general advice with likelihood attached
- **Induction/Analogy**
  - specific examples are used as a basis for improvement/extraploation
- **Explanation Based Learning**
  - analysis of a set of given examples to guide future problem solving
- **Case Based Reasoning**
  - previous experiences are recalled and adapted to resolve new ones
- **Model Based Reasoning**
  - models are constructed from both first and second principles
- **Neural Networks**
  - each node performs a simple computation operation independently

Basic Series Stats



- 12, 15, 20, 25, 22, 17, 15
- N = no. of values = 7
- Max value = 25
- Min value = 12
- Σ = Sum = 126
- Average = mean = Σ /N = 18
- Mode (most popular value) = 15
- Median (value that splits series) = 17

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Deviations

12, 15, 20, 25, 22, 17, 15 Average = 18

deviances = 6, 3, 2, 7, 4, 1, 3 AD = 3.7

devs squared = 36, 9, 4, 49, 16, 1, 9

Σ devs squared = 124

s^2 = variance = Σ devs squared/N = 17.7

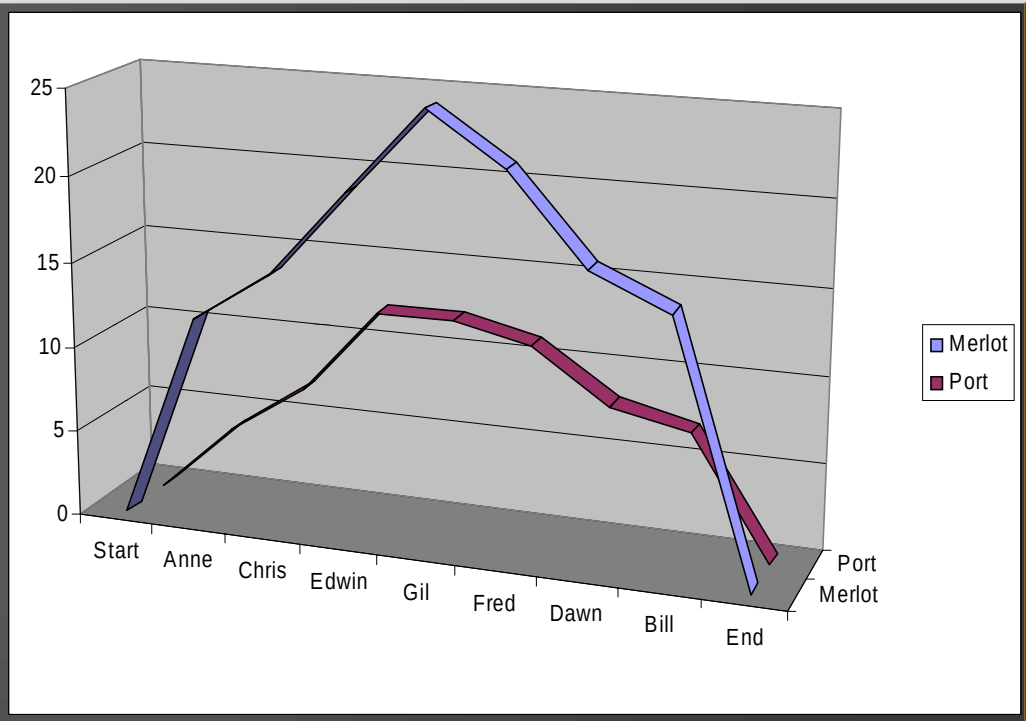
s = Standard deviation = $\sqrt{s^2}$ = 4.2

s_p = Standard deviation sample = 4.5

$s_p = SQRT [n S x^2 - (Sx)^2]/[n(n-1)]$

Port estimates

	M	P
Anne	12	4
Chris	15	7
Edwin	20	12
Gil	25	12
Fred	22	11
Dawn	17	8
Bill	15	7



	Merlot	Port
skew	-0.8	-0.5
kurt	-0.4	-1.1
correlation	0.98	

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Start | Graphics Server | Explore Reports | Microsoft PowerPoint - [cm...] 17:46

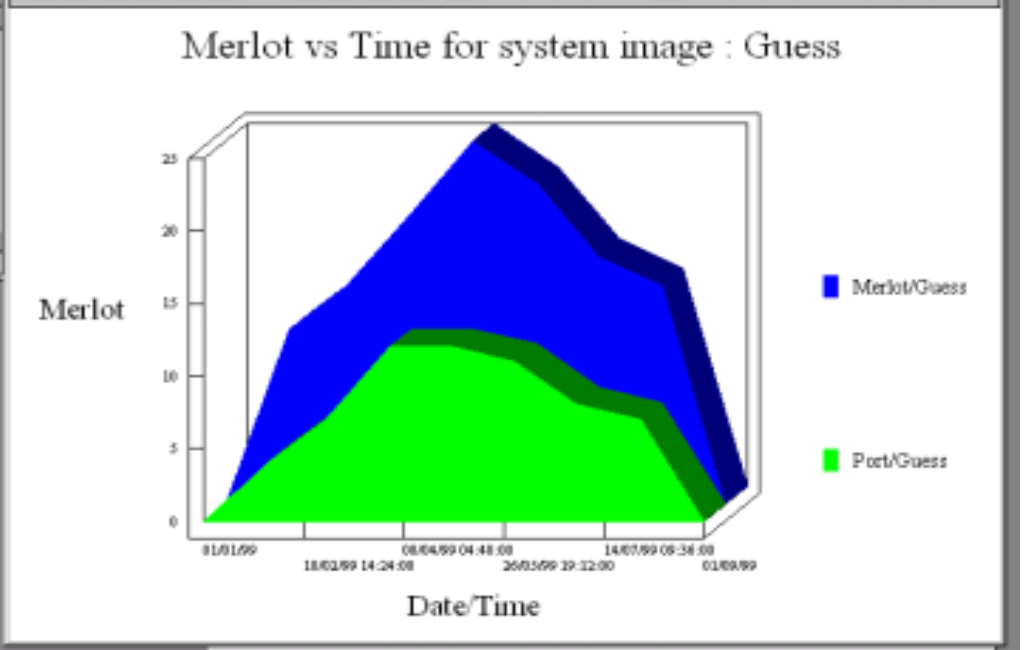
Explore Reports

File Chart Export Time Series Analysis Window Help

Data Table (using data from E:\PROGRA~1\ATHENE\CUSTOMDB\MERLOTS.CDB\MERL...

	Date/Time	Merlot/Guess	Date/Time	Port/Guess
1	19990101\000000	0.00	19990101\000000	0.00
2	19990201\000000	12.00	19990201\000000	4.00
3	19990301\000000	15.00	19990301\000000	7.00
4	19990401\000000	20.00	19990401\000000	12.00
5	19990501\000000	25.00	19990501\000000	12.00
6	19990601\000000	22.00	19990601\000000	11.00
7	19990701\000000	17.00	19990701\000000	8.00
8	19990801\000000	15.00	19990801\000000	7.00
9	19990901\000000	0.00	19990901\000000	0.00

Graph (using data from E:\PROGRA~1\ATHENE\CUSTOMDB\MERLOTS.CDB\MERLOT2.SER)



Statistics for Guess

Statistics of Merlot for system image Guess

Basic Information

Number of Observations :	7	Sum of Data :	126.00
Minimum Value :	12.00	Maximum Value :	25.00

General Statistics

Mean Value :	18.00	Average Deviation :	3.71
Standard Deviation :	4.55	Variance :	20.67

Shape Statistics

Skewness :	0.22	Kurtosis :	-1.62

Close Help

Statistics for Guess

Statistics of Port for system image Guess

Basic Information

Number of Observations :	7	Sum of Data :	61.00
Minimum Value :	4.00	Maximum Value :	12.00

General Statistics

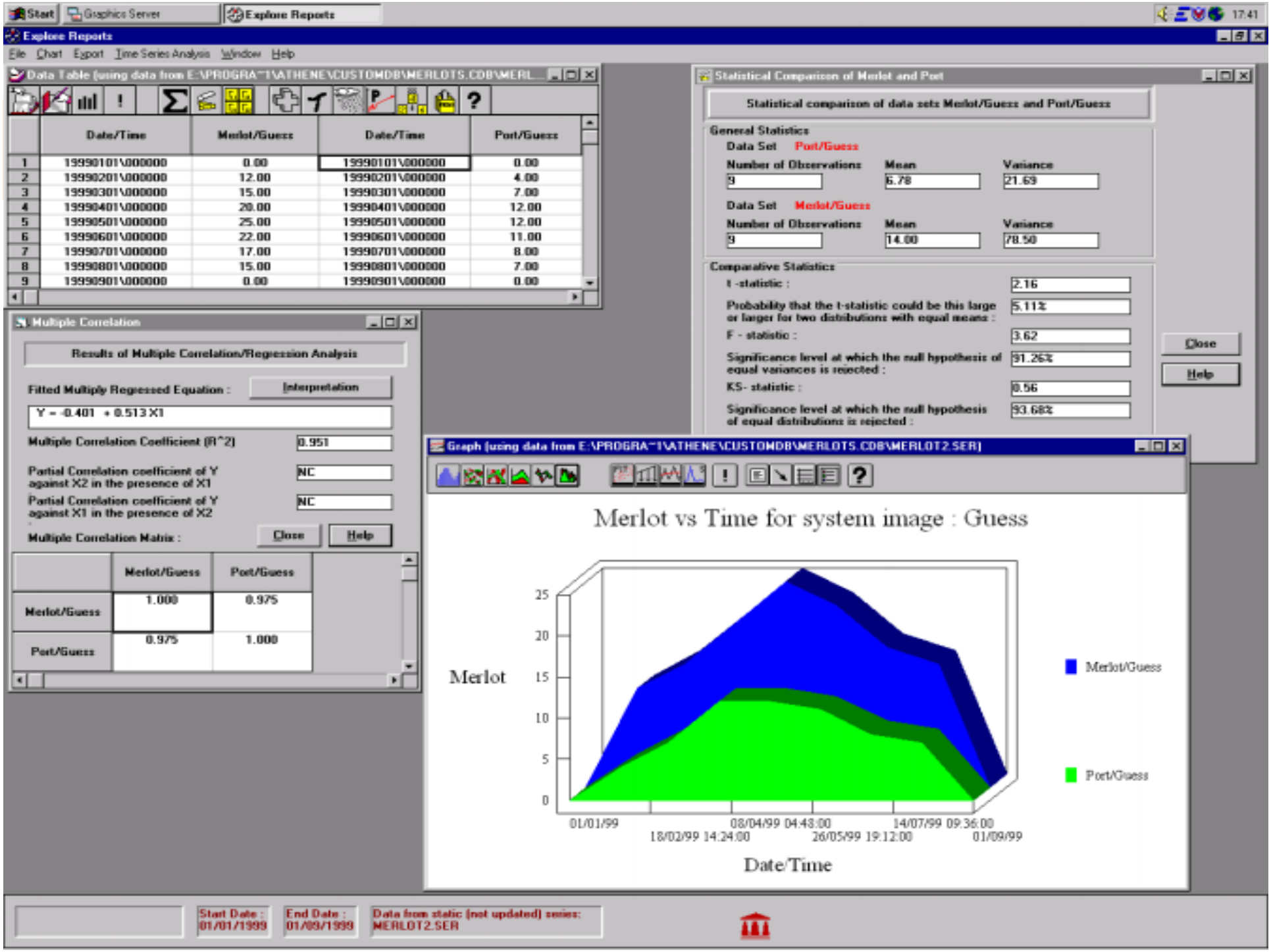
Mean Value :	8.71	Average Deviation :	2.53
Standard Deviation :	3.04	Variance :	9.24

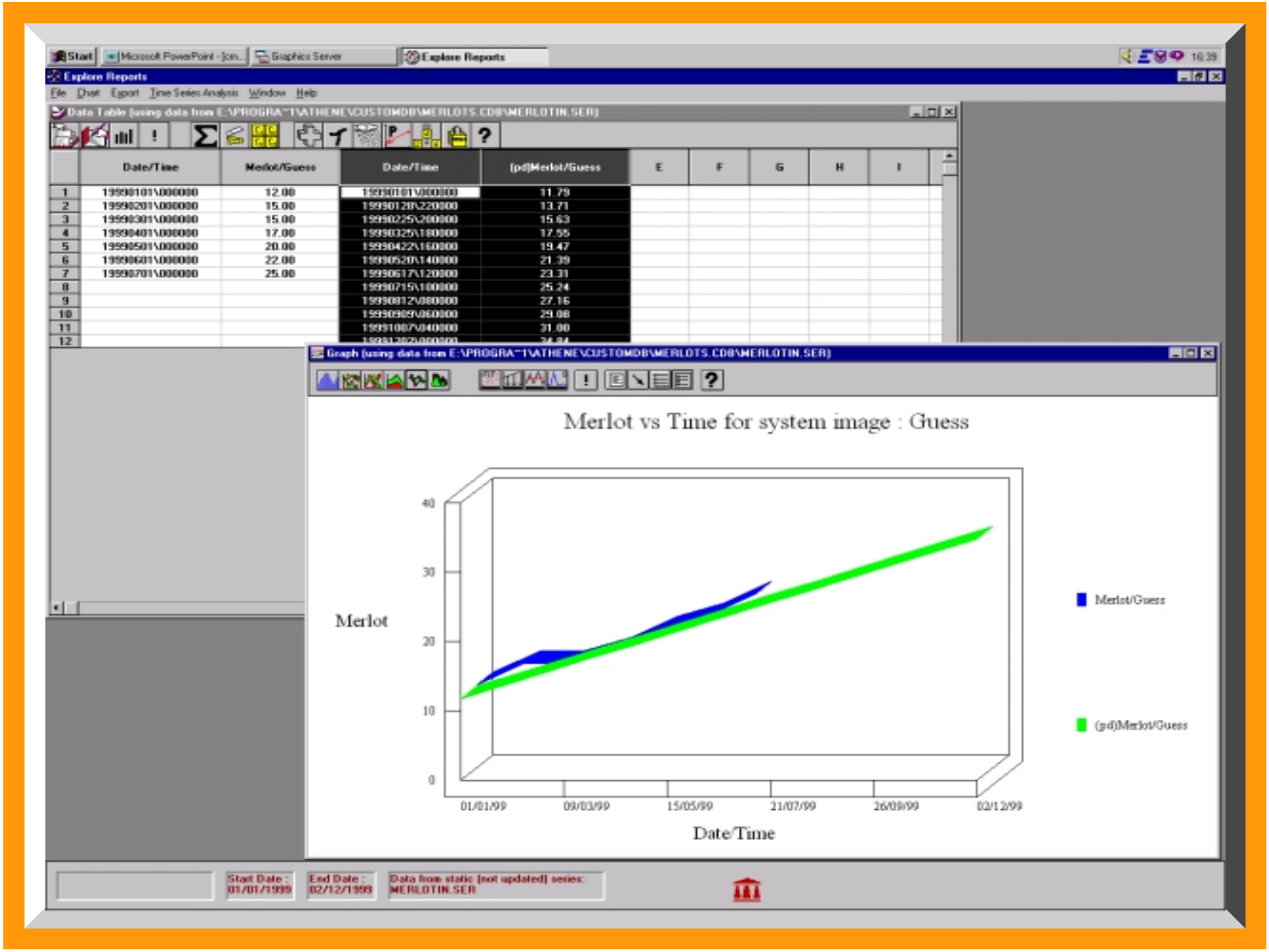
Shape Statistics

Skewness :	-0.16	Kurtosis :	-1.71

Close Help

Start Date : 01/01/1999 End Date : 01/09/1999 Data from static (not updated) series: MERLOT2.SER


Start
Graphics Server
Explore Reports
17:41
Explore Reports
File Chart Export Time Series Analysis Window Help
Data Table (using data from E:\PROGRA~1\ATHENE\CUSTOMDB\MERLOTS.CDB\MERL...
Date/Time
Merlot/Guess
Date/Time
Port/Guess
1 19990101\000000 0.00 19990101\000000 0.00
2 19990201\000000 12.00 19990201\000000 4.00
3 19990301\000000 15.00 19990301\000000 7.00
4 19990401\000000 20.00 19990401\000000 12.00
5 19990501\000000 25.00 19990501\000000 12.00
6 19990601\000000 22.00 19990601\000000 11.00
7 19990701\000000 17.00 19990701\000000 8.00
8 19990801\000000 15.00 19990801\000000 7.00
9 19990901\000000 0.00 19990901\000000 0.00
Statistical Comparison of Merlot and Port
Statistical comparison of data sets Merlot/Guess and Port/Guess
General Statistics
Data Set Port/Guess
Number of Observations 9
Mean 6.78
Variance 21.69
Data Set Merlot/Guess
Number of Observations 9
Mean 14.00
Variance 78.50
Comparative Statistics
t -statistic : 2.16
Probability that the t-statistic could be this large or larger for two distributions with equal means : 5.11%
F - statistic : 3.62
Significance level at which the null hypothesis of equal variances is rejected : 91.26%
KS- statistic : 0.56
Significance level at which the null hypothesis of equal distributions is rejected : 93.68%
Close
Help
Multiple Correlation
Results of Multiple Correlation/Regression Analysis
Fitted Multiply Regressed Equation :
Interpretation
Y = -0.401 + 0.513 X1
Multiple Correlation Coefficient (R^2) 0.951
Partial Correlation coefficient of Y against X2 in the presence of X1 NC
Partial Correlation coefficient of Y against X1 in the presence of X2 NC
Multiple Correlation Matrix :
Close
Help
Merlot/Guess Port/Guess
Merlot/Guess 1.000 0.975
Port/Guess 0.975 1.000
Graph (using data from E:\PROGRA~1\ATHENE\CUSTOMDB\MERLOTS.CDB\MERLOT2.SER)
Merlot vs Time for system image : Guess
Merlot
25
20
15
10
5
0
01/01/99
18/02/99 14:24:00
08/04/99 04:48:00
26/05/99 19:12:00
14/07/99 09:36:00
01/09/99
Date/Time
Merlot/Guess
Port/Guess
Start Date : 01/01/1999
End Date : 01/09/1999
Data from static (not updated) series: MERLOT2.SER


Start
Explore Reports
File Chart Export Time Series Analysis Window Help
Data Table (using data from E:\PROGRA~1\ATHENE\CUSTOMDB\MERLOTS.CDB\MERLOTIN.SER)
Date/Time
Merlot/Guess
Date/Time
(pd)Merlot/Guess
19990101\000000 12.00 19990101\000000 11.79
19990201\000000 15.00 19990128\220000 13.71
19990301\000000 15.00 19990225\200000 15.63
19990401\000000 17.00 19990325\180000 17.55
19990501\000000 20.00 19990422\160000 19.47
19990601\000000 22.00 19990520\140000 21.39
19990701\000000 25.00 19990617\120000 23.31
19990715\100000 25.24
19990812\080000 27.16
19990909\060000 29.08
19991007\040000 31.00
Graph (using data from E:\PROGRA~1\ATHENE\CUSTOMDB\MERLOTS.CDB\MERLOTIN.SER)
Merlot vs Time for system image : Guess
Merlot
40
30
20
10
0
01/01/99
09/03/99
15/05/99
21/07/99
26/09/99
02/12/99
Date/Time
Merlot/Guess
(pd)Merlot/Guess
Start Date : 01/01/1999
End Date : 02/12/1999
Data from static [not updated] series: MERLOTIN.SER

Other prediction

Response Time Law

R = S/(1 - U)

Erlang's C Function - Multi-Server Response Time

R = S[1 + C(m,ρ)/m(1 - ρ) where

$C(m,\rho) = [(m\rho)^m/m!]/(1-\rho)\Sigma(m\rho)^k/k! + (m\rho)^m/m!]$

Harrison's Ethernet Delay Law

$$\sum_{i=1}^{16} \frac{p^{i-1}(1-p)}{(1-p^{16})} \left((i-1)(T_{IFG} + T_{JAM} + R) + \rho\frac{T}{2} + \left(\sum_{j=1}^{i-1} \left(\frac{2^{\min(j,10)} - 1}{2} \right) \right) T_{SLOT} \right)$$

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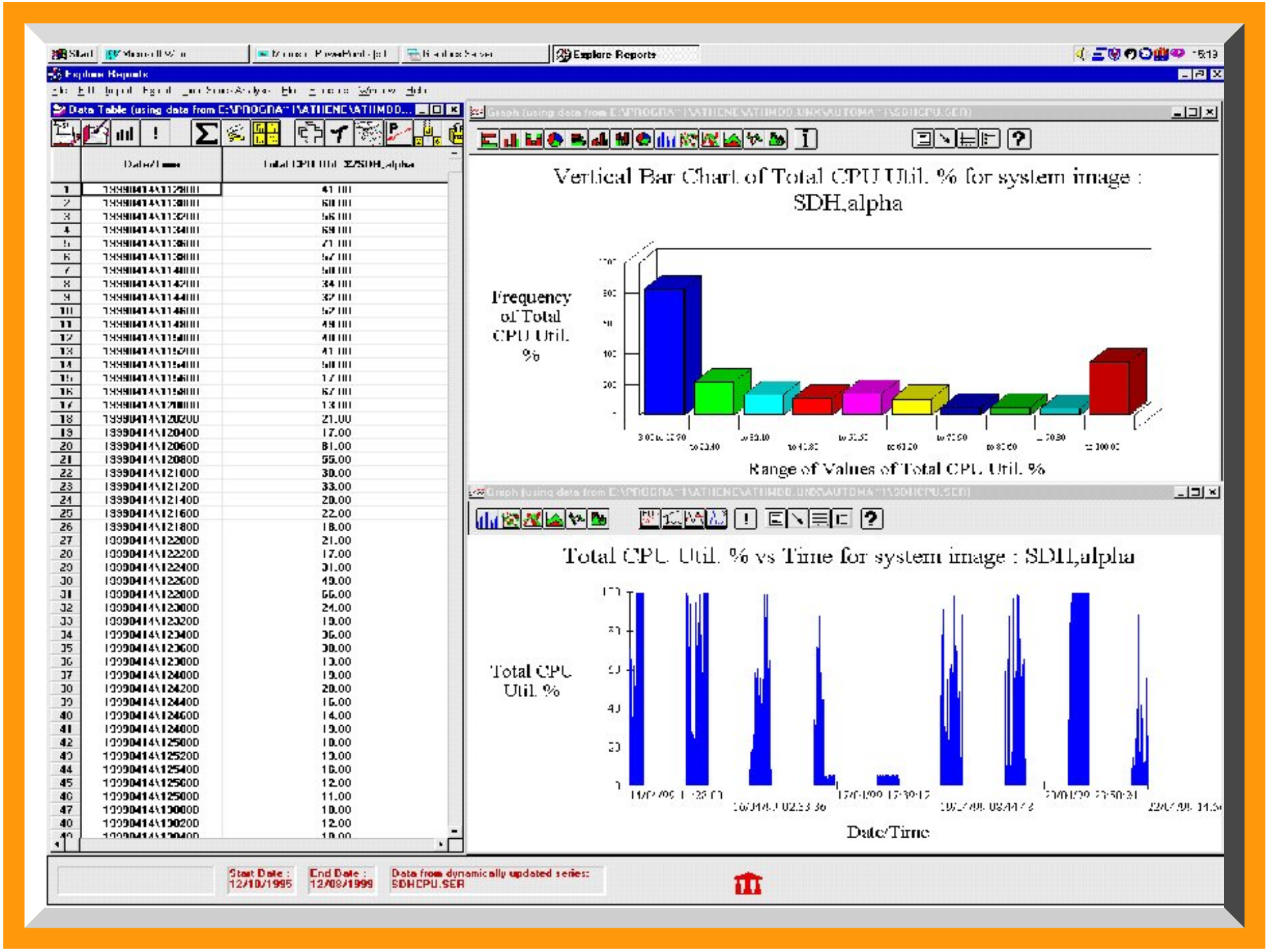
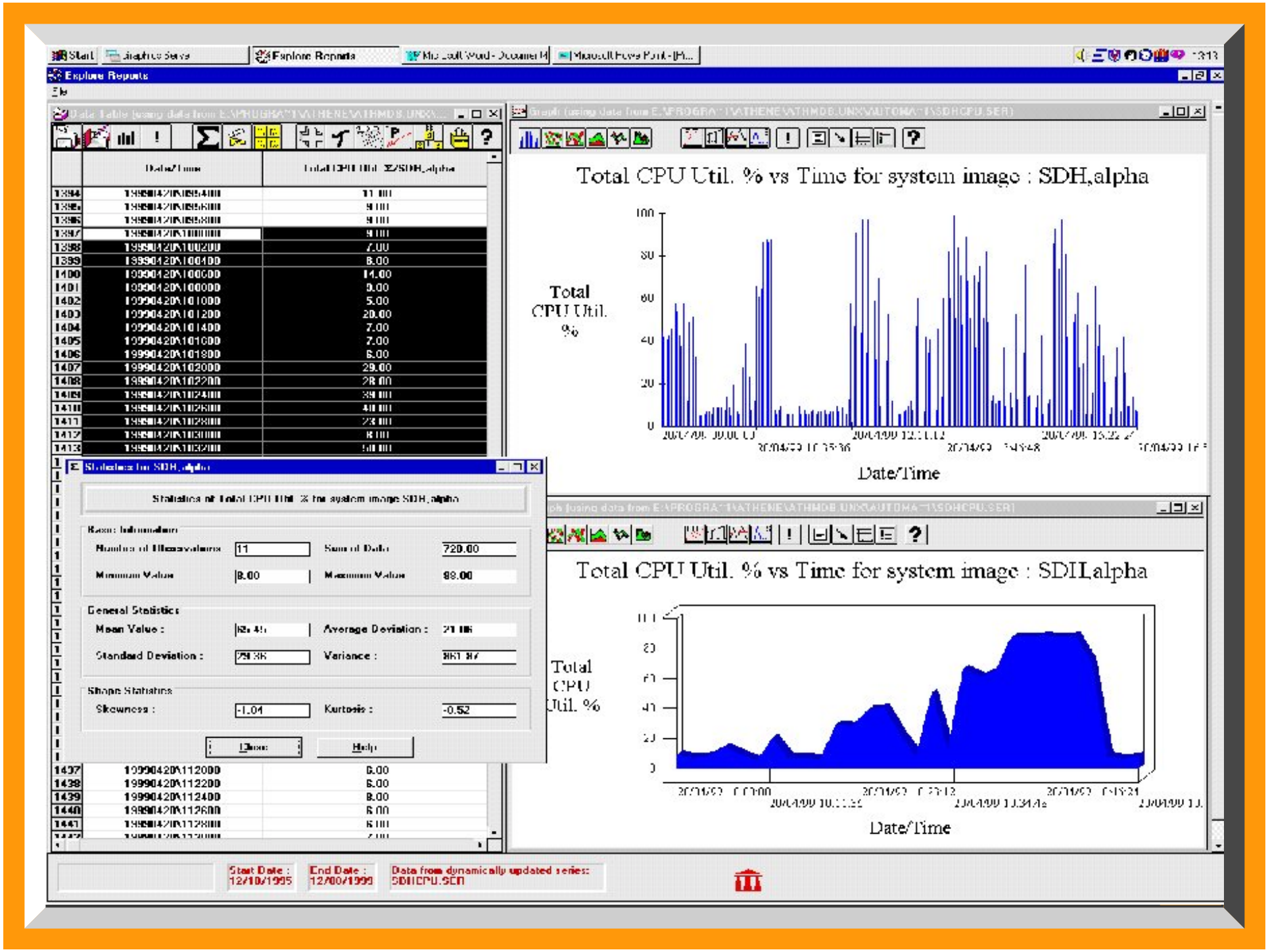

Explore Reports
Data Table (using data from C:\PROGRA~1\ATTICENC\ATTIMDD...
Graph (using data from C:\PROGRA~1\ATTICENC\ATTIMDD.UNX\AUTOMA~1\SDHCPU.SER)
Vertical Bar Chart of Total CPU Util. % for system image : SDH,alpha
Frequency of Total CPU Util. %
Range of Values of Total CPU Util. %
Total CPU Util. % vs Time for system image : SDH,alpha
Total CPU Util. %
Date/Time
Start Date : 12/10/1995
End Date : 12/08/1999
Data from dynamically updated series: SDHCPU.SER


Explore Reports
Total CPU Util. % vs Time for system image : SDH,alpha
Total CPU Util. %
Date/Time
Total CPU Util. % vs Time for system image : SDII,alpha
Total CPU Util. %
Date/Time
Statistics for SDH_alpha
Number of Observations: 11
Sum of Data: 720.00
Minimum Value: 8.00
Maximum Value: 99.00
General Statistics
Mean Value: 82.45
Average Deviation: 21.86
Standard Deviation: 29.36
Variance: 861.87
Shape Statistics
Skewness: -1.04
Kurtosis: -0.52
Close
Help
Start Date: 12/10/1995
End Date: 12/00/1999
Data from dynamically updated series: SDIICPU.SER

SYSTEM PERFORMANCE REPORT

FOR INSTALLATION SDH, SYSTEM IMAGE ALPHA

ANALYSIS PERIOD 20/04/99 09:00 - 20/04/99 17:00

CPU SUMMARY

Total CPU Util. (%)

Highest value of 99.00 (%) occurred at 20/04/99 13:54
Lowest value of 5.00 (%) occurred at 20/04/99 09:38
Average Value of 31.50 (%)

I/O SUMMARY

Physical Read/Writes (/sec)

Highest value of 62.00 (/sec) occurred at 20/04/99 15:40
Lowest value of 2.00 (/sec) occurred at 20/04/99 11:08
Average Value of 7.08 (/sec)

USER SUMMARY

CPU Total (secs): Busiest Users over the Measurement Period

Total of CPU Total (secs): 8347.53

UNIX User	CPU Total (secs)	% of CPU Total (secs)	Cumulative %
oracle	4153.00	49.75%	49.75%
delphi	2699.94	32.34%	82.09%

COMMAND SUMMARY

CPU Total (secs): Busiest Commands over the Measurement Period

Total of CPU Total (secs): 8348.54

UNIX Command	CPU Total (secs)	% of CPU Total (secs)	Cumulative %
oraclelive	4021.00	48.16%	48.16%
oracle	846.35	10.14%	70.09%
dfrunreport	829.62	9.94%	80.03%

ORACLE SYSTEM PERFORMANCE REPORT

FOR INSTALLATION SDH, SYSTEM IMAGE WORLD+LIVE

ANALYSIS PERIOD 20/04/99 09:00 - 20/04/99 17:00

SYSTEM SUMMARY

Total CPU Util. (%)

Highest value of 92.30 (%) occurred at 20/04/99 15:42

Lowest value of 0.60 (%) occurred at 20/04/99 09:38

Average Value of 15.37 (%)

FILE I/O SUMMARY

Physical Reads/Writes (/sec): Busiest Files over the Measurement Period

Total of Physical Reads/Writes (/sec): 3105847.84

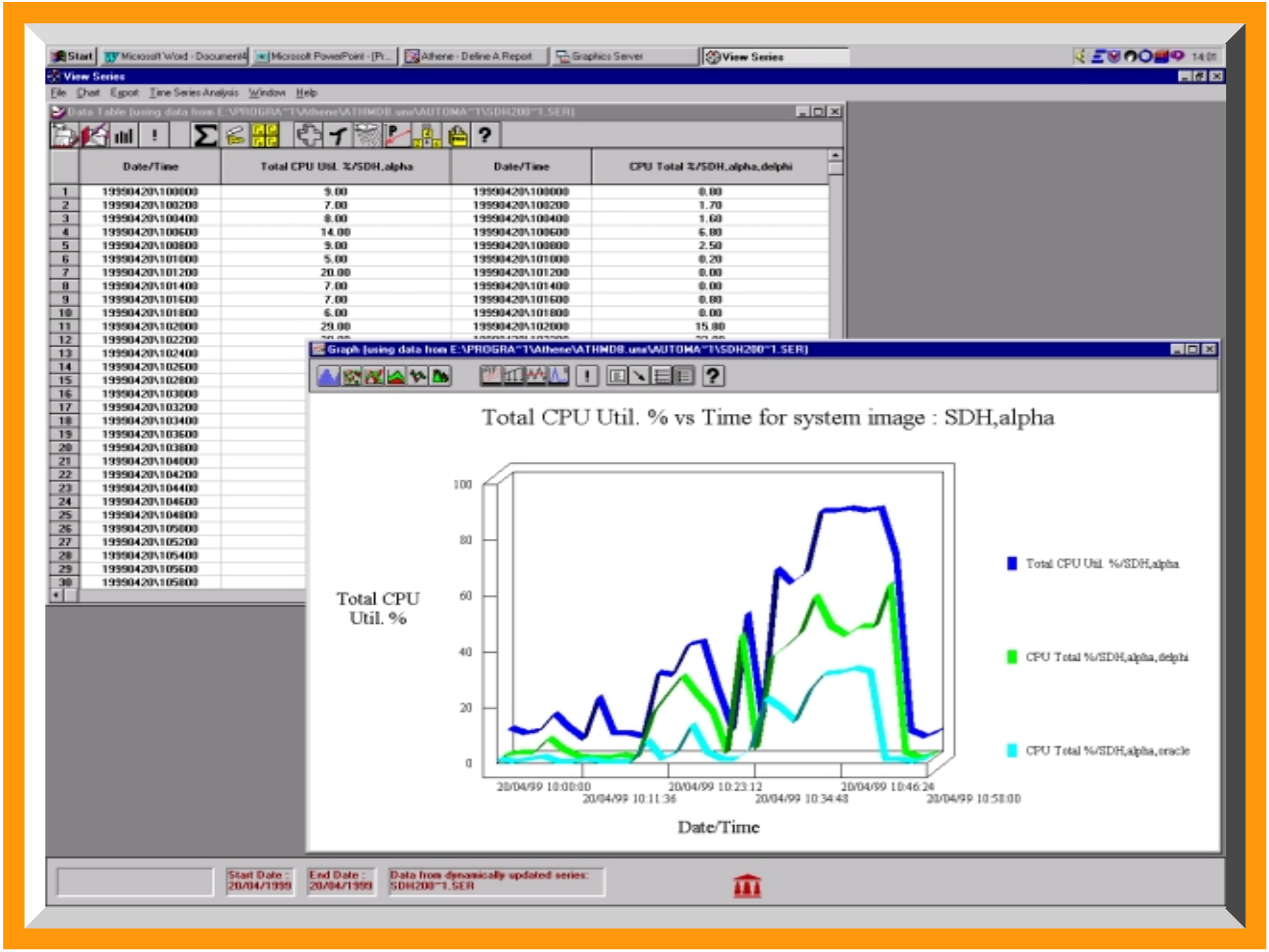
Oracle File	*Physical Read/Writes (/sec)*	*% of Physical Read/Writes (/sec)*
/midland/oracle/live/data/data_ts02.dbf	100.69	93.37%
/midland/oracle/live/data/data_ts01.dbf	6.41	5.94%

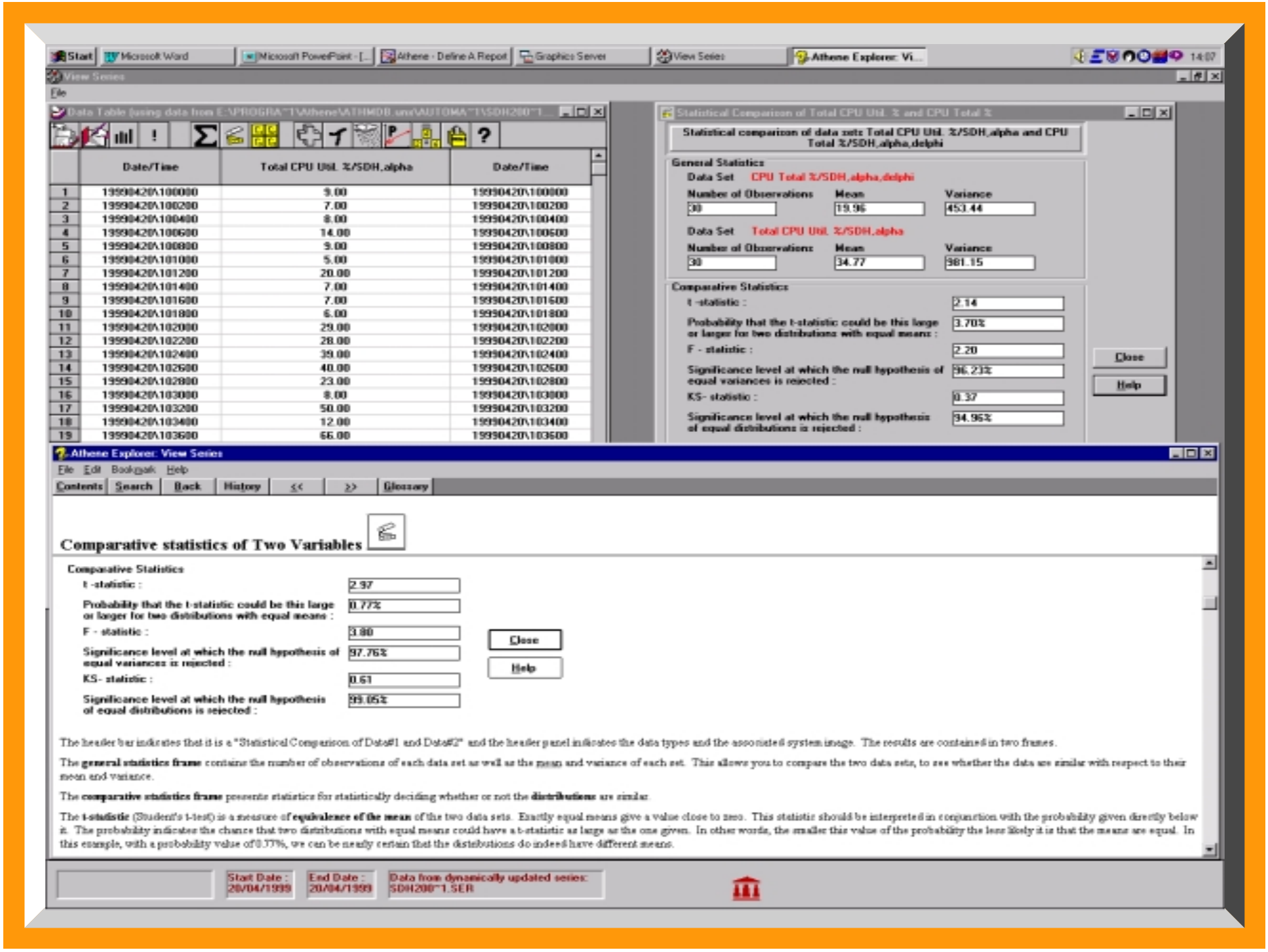
SESSION SUMMARY

Session Logical I/O (/sec): Busiest Sessions over the Measurement Period

Total of Session Logical I/O (/sec): 13700.09

Oracle Session	*Session Logical I/O (/sec)*	*% of Session Logical I/O (/sec)*
DELPHI, 16, 317, delphi, 9482, oracle@ALPHA (TNS V1-V2)	845.77	6.17%
DELPHI, 15, 1521, pridpath, 23366, oracle@ALPHA (TNS V1-V2)	501.68	3.66%
DELPHI, 16, 16108, delphi, 525, oracle@ALPHA (TNS V1-V2)	482.24	3.52%
DELPHI, 14, 705, delphi, 7557, oracle@ALPHA (TNS V1-V2)	472.22	3.45%
DELPHI, 21, 1019, pridpath, 28306, oracle@ALPHA (TNS V1-V2)	461.32	3.37%
DELPHI, 15, 1976, ajames, 13905, oracle@ALPHA (TNS V1-V2)	452.74	3.30%
DELPHI, 15, 1736, pridpath, 29371, oracle@ALPHA (TNS V1-V2)	447.27	3.26%
DELPHI, 6, 601, apratt, 30825, oracle@ALPHA (TNS V1-V2)	446.17	3.26%
DELPHI, 21, 346, jsheen, 15725, oracle@ALPHA (TNS V1-V2)	429.79	3.14%
DELPHI, 16, 14207, ajames, 6380, oracle@ALPHA (TNS V1-V2)	420.20	3.07%
DELPHI, 21, 884, jsheen, 6425, oracle@ALPHA (TNS V1-V2)	419.34	3.06%
DELPHI, 20, 318, pridpath, 30858, oracle@ALPHA (TNS V1-V2)	405.10	2.96%
DELPHI, 15, 1687, apratt, 29957, oracle@ALPHA (TNS V1-V2)	386.82	2.82%
DELPHI, 21, 906, parcher, 225, oracle@ALPHA (TNS V1-V2)	385.58	2.81%
DELPHI, 6, 1579, jsheen, 13718, oracle@ALPHA (TNS V1-V2)	378.32	2.76%


View Series
File Chart Export Time Series Analysis Window Help
Data Table (using data from E:\PROGRA~1\Athene\ATHMDB.uns\AUTOMA~1\SDH200~1.SER)
Date/Time
Total CPU Util. %/SDH,alpha
Date/Time
CPU Total %/SDH,alpha,delphi
1 19990420\100000 9.00 19990420\100000 0.00
2 19990420\100200 7.00 19990420\100200 1.70
3 19990420\100400 8.00 19990420\100400 1.60
4 19990420\100600 14.00 19990420\100600 6.80
5 19990420\100800 9.00 19990420\100800 2.50
6 19990420\101000 5.00 19990420\101000 0.20
7 19990420\101200 20.00 19990420\101200 0.00
8 19990420\101400 7.00 19990420\101400 0.00
9 19990420\101600 7.00 19990420\101600 0.80
10 19990420\101800 6.00 19990420\101800 0.00
11 19990420\102000 29.00 19990420\102000 15.80
12 19990420\102200
13 19990420\102400
14 19990420\102600
15 19990420\102800
16 19990420\103000
17 19990420\103200
18 19990420\103400
19 19990420\103600
20 19990420\103800
21 19990420\104000
22 19990420\104200
23 19990420\104400
24 19990420\104600
25 19990420\104800
26 19990420\105000
27 19990420\105200
28 19990420\105400
29 19990420\105600
30 19990420\105800
Graph (using data from E:\PROGRA~1\Athene\ATHMDB.uns\AUTOMA~1\SDH200~1.SER)
Total CPU Util. % vs Time for system image : SDH,alpha
Total CPU Util. %
100
80
60
40
20
0
20/04/99 10:00:00
20/04/99 10:11:36
20/04/99 10:23:12
20/04/99 10:34:48
20/04/99 10:46:24
20/04/99 10:58:00
Date/Time
Total CPU Util. %/SDH,alpha
CPU Total %/SDH,alpha,delphi
CPU Total %/SDH,alpha,oracle
Start Date : 20/04/1999
End Date : 20/04/1999
Data from dynamically updated series: SDH200~1.SER


Start
Microsoft Word
Microsoft PowerPoint - [...
Athene - Define A Report
Graphics Server
View Series
Athene Explorer: Vi...
14:07
View Series
File
Data Table (using data from E:\PROGRA~1\Athene\ATHMDB.una\AUTOMA~1\SDH200~1...
Date/Time
Total CPU Util. %/SDH,alpha
Date/Time
1 19990420\100000 9.00 19990420\100000
2 19990420\100200 7.00 19990420\100200
3 19990420\100400 8.00 19990420\100400
4 19990420\100600 14.00 19990420\100600
5 19990420\100800 9.00 19990420\100800
6 19990420\101000 5.00 19990420\101000
7 19990420\101200 20.00 19990420\101200
8 19990420\101400 7.00 19990420\101400
9 19990420\101600 7.00 19990420\101600
10 19990420\101800 6.00 19990420\101800
11 19990420\102000 29.00 19990420\102000
12 19990420\102200 28.00 19990420\102200
13 19990420\102400 39.00 19990420\102400
14 19990420\102600 40.00 19990420\102600
15 19990420\102800 23.00 19990420\102800
16 19990420\103000 8.00 19990420\103000
17 19990420\103200 50.00 19990420\103200
18 19990420\103400 12.00 19990420\103400
19 19990420\103600 66.00 19990420\103600
Statistical Comparison of Total CPU Util. % and CPU Total %
Statistical comparison of data sets Total CPU Util. %/SDH,alpha and CPU Total %/SDH,alpha,delphi
General Statistics
Data Set CPU Total %/SDH,alpha,delphi
Number of Observations 30 Mean 19.96 Variance 453.44
Data Set Total CPU Util. %/SDH,alpha
Number of Observations 30 Mean 34.77 Variance 981.15
Comparative Statistics
t -statistic : 2.14
Probability that the t-statistic could be this large or larger for two distributions with equal means : 3.70%
F - statistic : 2.20
Significance level at which the null hypothesis of equal variances is rejected : 96.23%
KS- statistic : 0.37
Significance level at which the null hypothesis of equal distributions is rejected : 94.96%
Close
Help
Athene Explorer: View Series
File Edit Bookmark Help
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Comparative statistics of Two Variables
Comparative Statistics
t -statistic : 2.97
Probability that the t-statistic could be this large or larger for two distributions with equal means : 0.77%
F - statistic : 3.80
Significance level at which the null hypothesis of equal variances is rejected : 97.76%
KS- statistic : 0.61
Significance level at which the null hypothesis of equal distributions is rejected : 99.05%
Close
Help
The header bar indicates that it is a "Statistical Comparison of Data#1 and Data#2" and the header panel indicates the data types and the associated system image. The results are contained in two frames.
The general statistics frame contains the number of observations of each data set as well as the mean and variance of each set. This allows you to compare the two data sets, to see whether the data are similar with respect to their mean and variance.
The comparative statistics frame presents statistics for statistically deciding whether or not the distributions are similar.
The t-statistic (Student's t-test) is a measure of equivalence of the mean of the two data sets. Exactly equal means give a value close to zero. This statistic should be interpreted in conjunction with the probability given directly below it. The probability indicates the chance that two distributions with equal means could have a t-statistic as large as the one given. In other words, the smaller this value of the probability the less likely it is that the means are equal. In this example, with a probability value of 0.77%, we can be nearly certain that the distributions do indeed have different means.
Start Date : 20/04/1999
End Date : 20/04/1999
Data from dynamically updated series: SDH200~1.SER


View Series
File Chart Export Time Series Analysis Window Help
Date/Time
Total CPU Util. %/SDH,alpha
Date/Time
CPU Total %/SDH,alpha,delphi
1 19990420\100000 9.00 19990420\100000 0.00
2 19990420\100200 7.00 19990420\100200 1.70
3 19990420\100400 8.00 19990420\100400 1.60
4 19990420\100600 14.00 19990420\100600 6.80
CPU Total % vs Time for system image : SDH,alpha,delphi
CPU Total %
Date/Time
Total CPU Util. % vs Time for system image : SDH,alpha
Total CPU Util. %
Date/Time
Spectral Analysis Statistics
Spectral Analysis Results for (lsds)CPU Total %/SDH,alpha,delphi
A repetitive pattern occurs in the data
46.40
Minutes
Spectral Analysis Statistics
Spectral Analysis Results for (lsds)Total CPU Util. %/SDH,alpha
A repetitive pattern occurs in the data
23.20
Minutes
Spectral Analysis
Spectral Analysis of (lsds)CPU Total %/SDH,alpha,delphi
Power
Frequency
Spectral Analysis
Spectral Analysis of (lsds)Total CPU Util. %/SDH,alpha
Power
Power
Frequency
Start Date : 20/04/1999
End Date : 20/04/1999
Data from dynamically updated series: SDH200~1.SER

Correlation Report

CORRELATION REPORT
FOR INSTALLATION SDH, SYSTEM IMAGE ALPHA
ANALYSIS PERIOD 20/04/99 09:00 - 20/04/99 17:00

HIGHLY CORRELATED METRICS (100% - 95%)
No metrics were highly correlated.

CLOSELY CORRELATED METRICS (95% - 90%)
No metrics were closely correlated.

REASONABLY CORRELATED METRICS (90% - 70%)

Metric 1	Metric 2	Correlation Coefficient
Total CPU Util. (%)	CPU Total (secs) for UNIX User oracle	84.
Total CPU Util. (%)	CPU Total (secs) for UNIX Command oraclelive	83.
Total CPU Util. (%)	CPU Total (secs) for UNIX User delphi	70.

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Application of CI to Performance

- Support tools for educated user
- Exploit traditional statistics etc
- Valid for most commercial DP
- Useful lever to save time
- Use right tool for job
- Focus attention on key areas

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