Performance Testing using The Grinder

- Paul Evans – Senior Developer

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Agenda

- Overview of performance testing
- The Grinder
- Methodology
- Wrap-up
- Resources that can help
- Q&A

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Performance Testing, 1 of 3

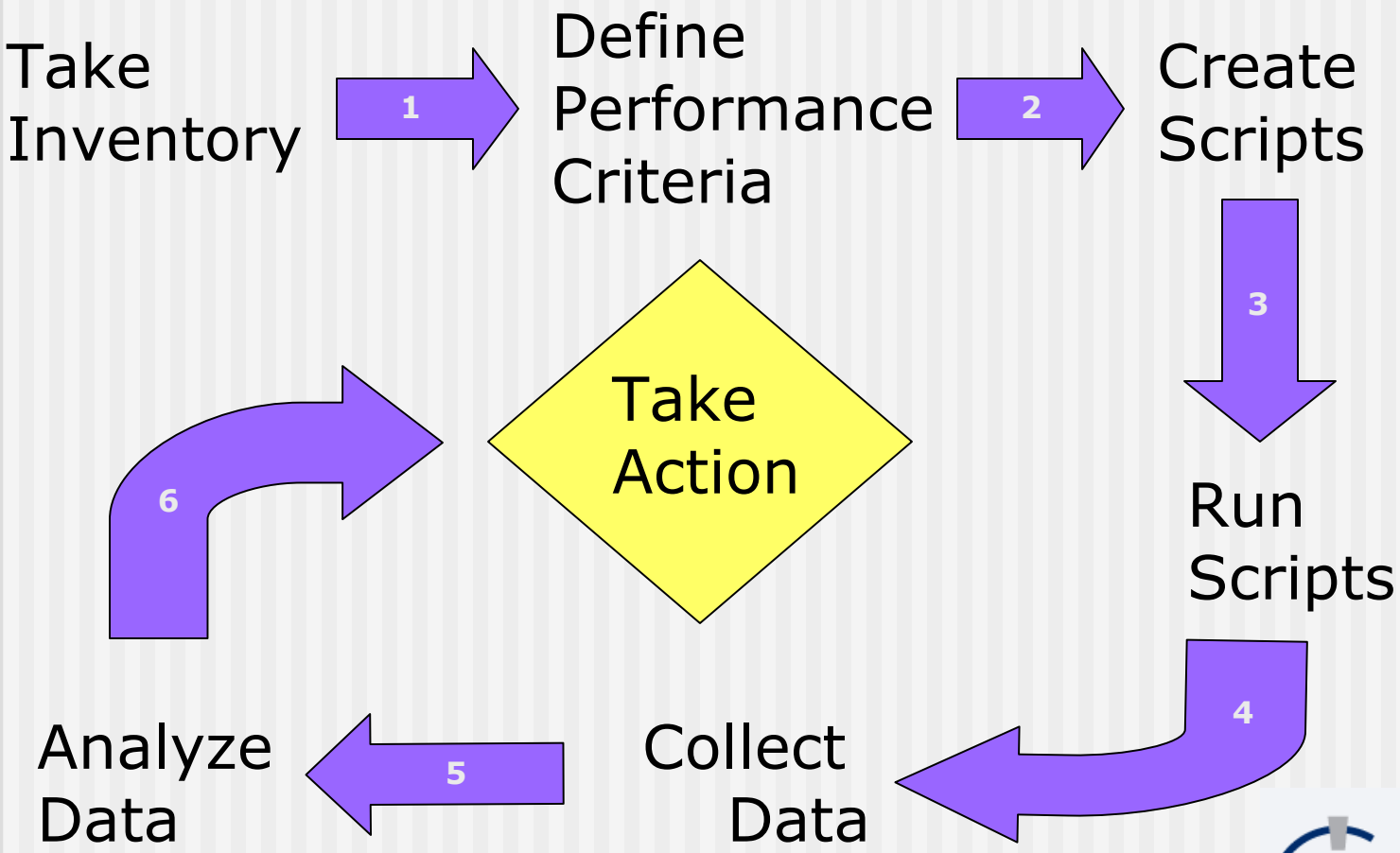
- What is performance testing?
- Goals of performance testing
- Two main types of applications to performance-test
  - User-interactive (most-common)
  - Back-end (non-user-interactive)

Performance Testing, 2 of 3

- Establishing performance criteria
  - "*Just make it go as fast as possible!*"

    vs:
  - "*The app will handle 300 simultaneous users with a maximum ART of 3 seconds.*"

Performance Testing, 3 of 3



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Grinder Configuration

- grinder.properties file

```
grinder.processes
grinder.threads
grinder.runs
grinder.script
grinder.sleepTimeVariation
grinder.initialSleepTime
grinder.logDirectory
```

Grinder Components

- Agent Process

```
>java -cp lib/grinder.jar net.grinder.Grinder
```

(assumes grinder.properties in current dir)

- Worker Processes
  - Started by the agent process
- Console

```
>java -cp lib/grinder.jar net.grinder.Console
```

- TCPProxy

```
>java -cp lib/grinder.jar net.grinder.TCPProxy
```

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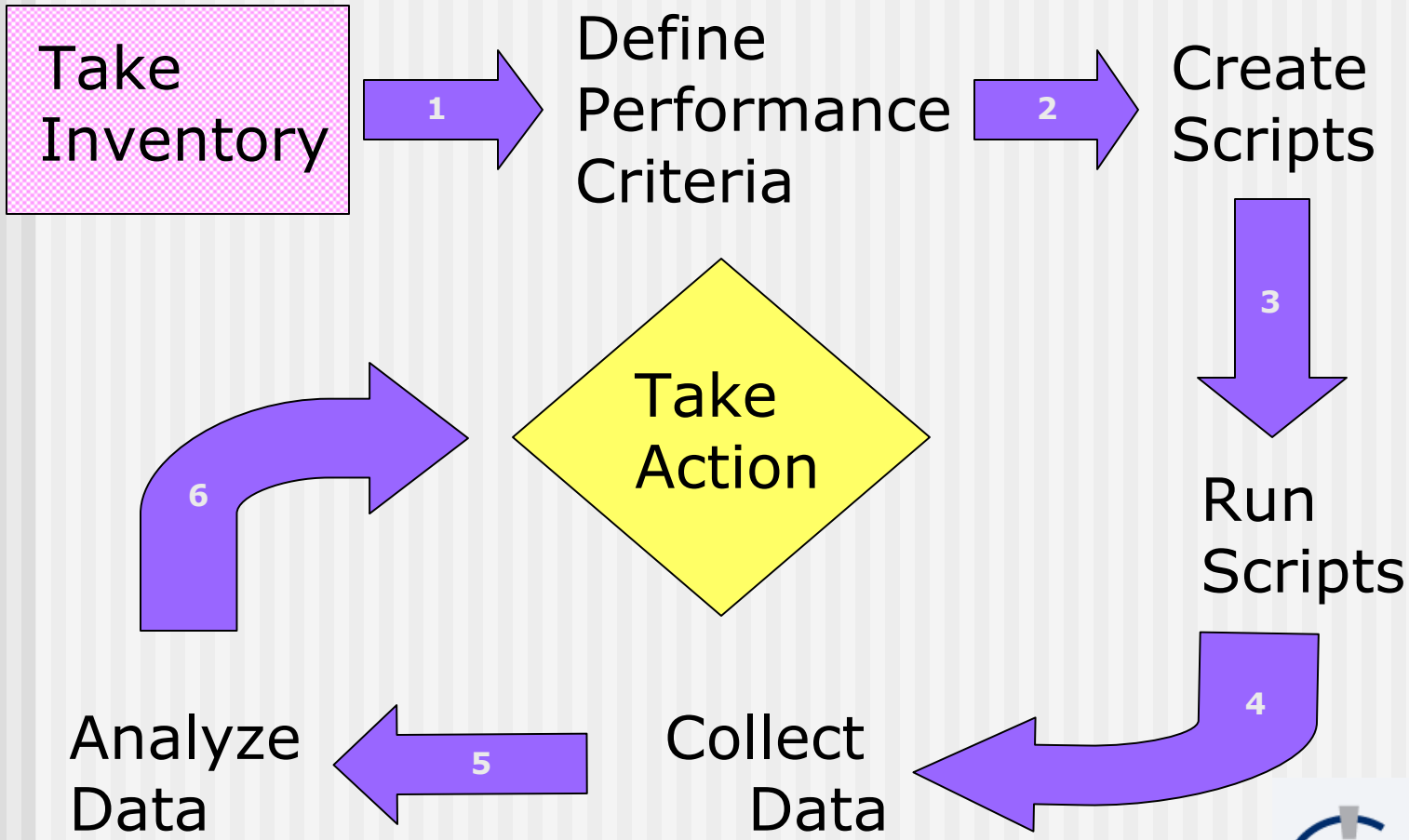
1. Take Inventory



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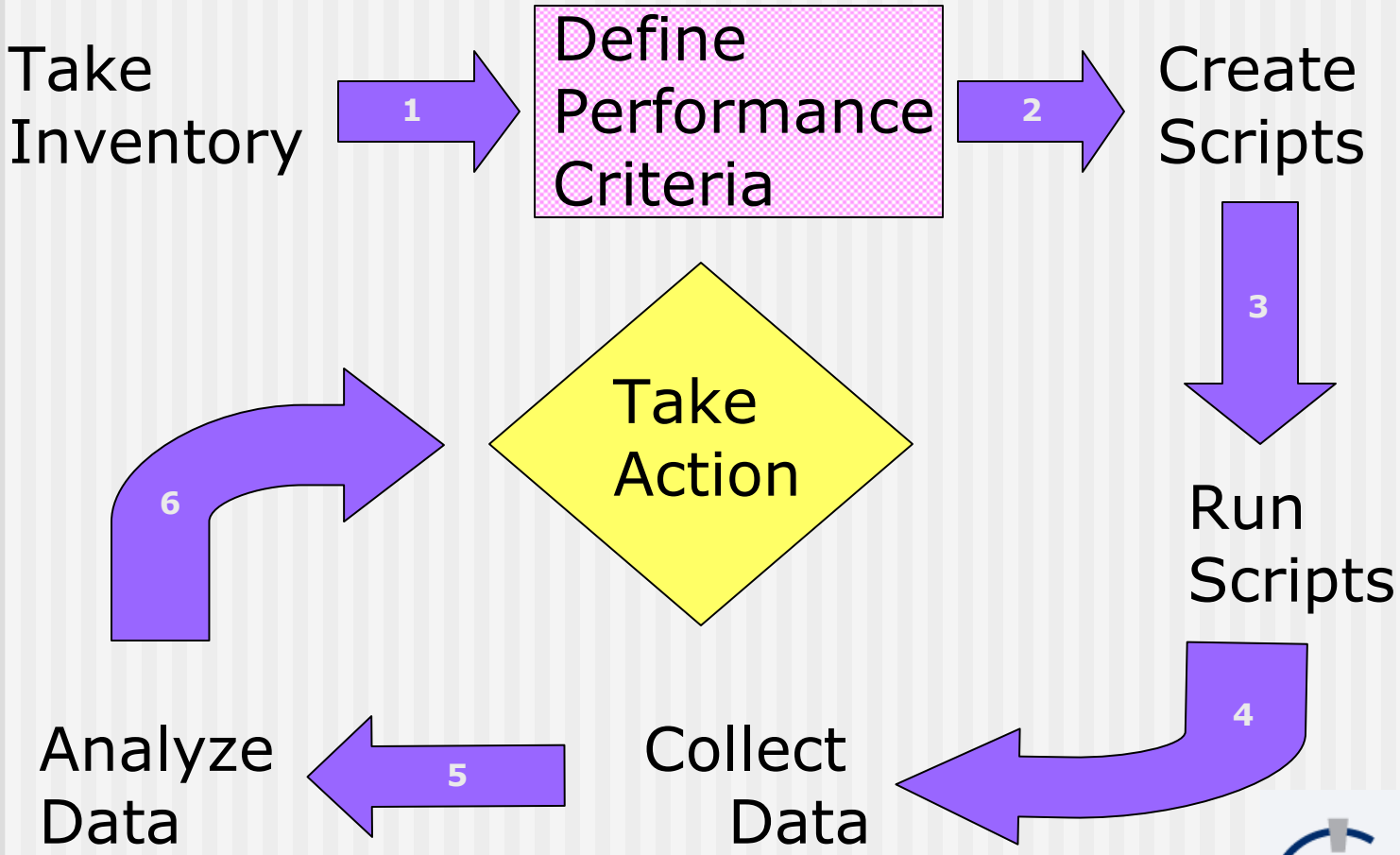
Take Inventory

- Document hardware
- Document software
  - Version information (be specific)
  - Parameters
    - Command-line
    - Defined in configuration file
- Document the network

2. Define Performance Criteria



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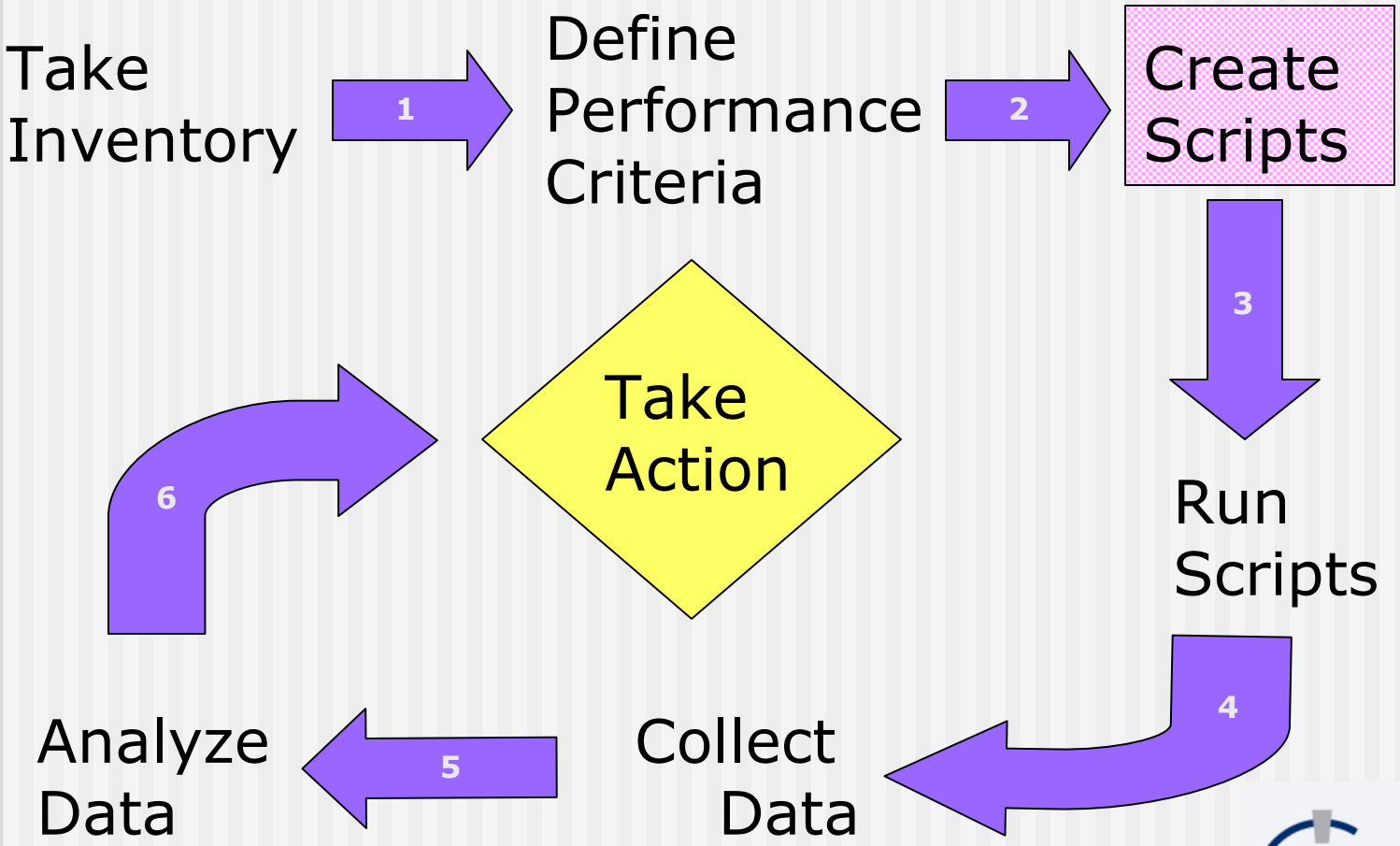
Define Performance Criteria

- Defined in the functional specification
- Use specific, non-ambiguous language
- State the target

3. Create Test Scripts



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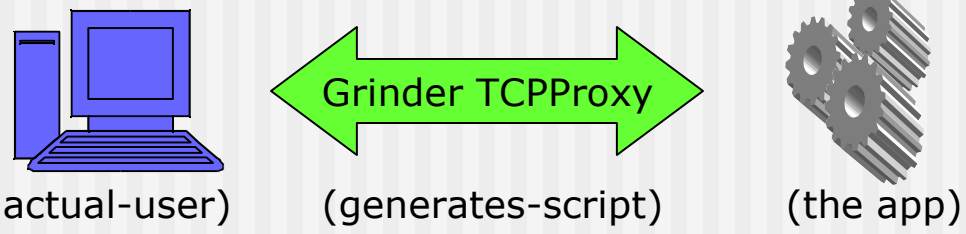
Create Test Scripts, 1 of 2

- Scripted-action to be taken against the application
- Models the behavior of actual users
- Models the behavior of a specific class of user (or usage-profile)

Create Test Scripts, 2 of 2

- Defining the usage profiles
  - Realistic usage patterns
  - Accurate weighting
  - Think time / variance
- Automated script generation using proxy-tools



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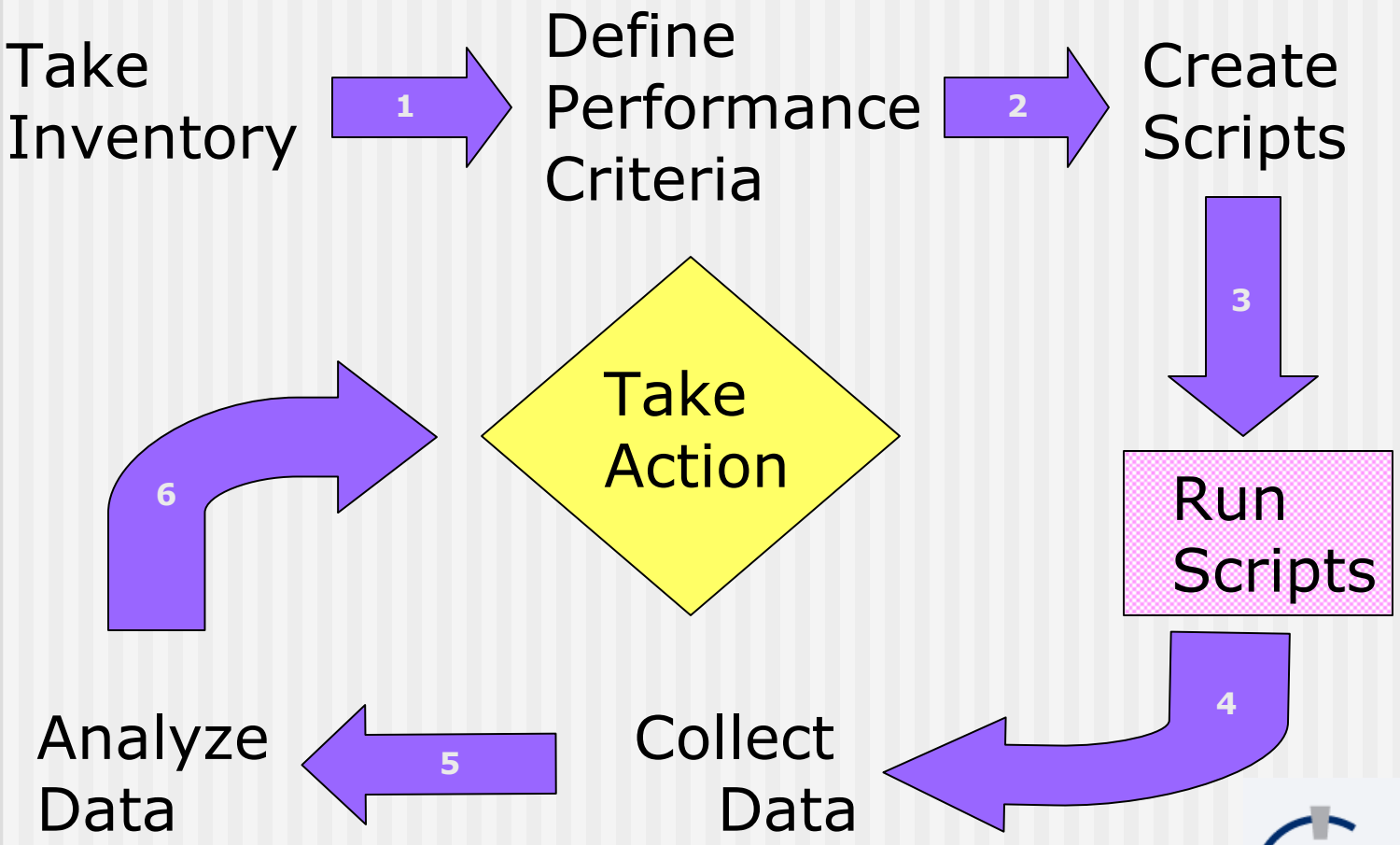
4. Running the Scripts



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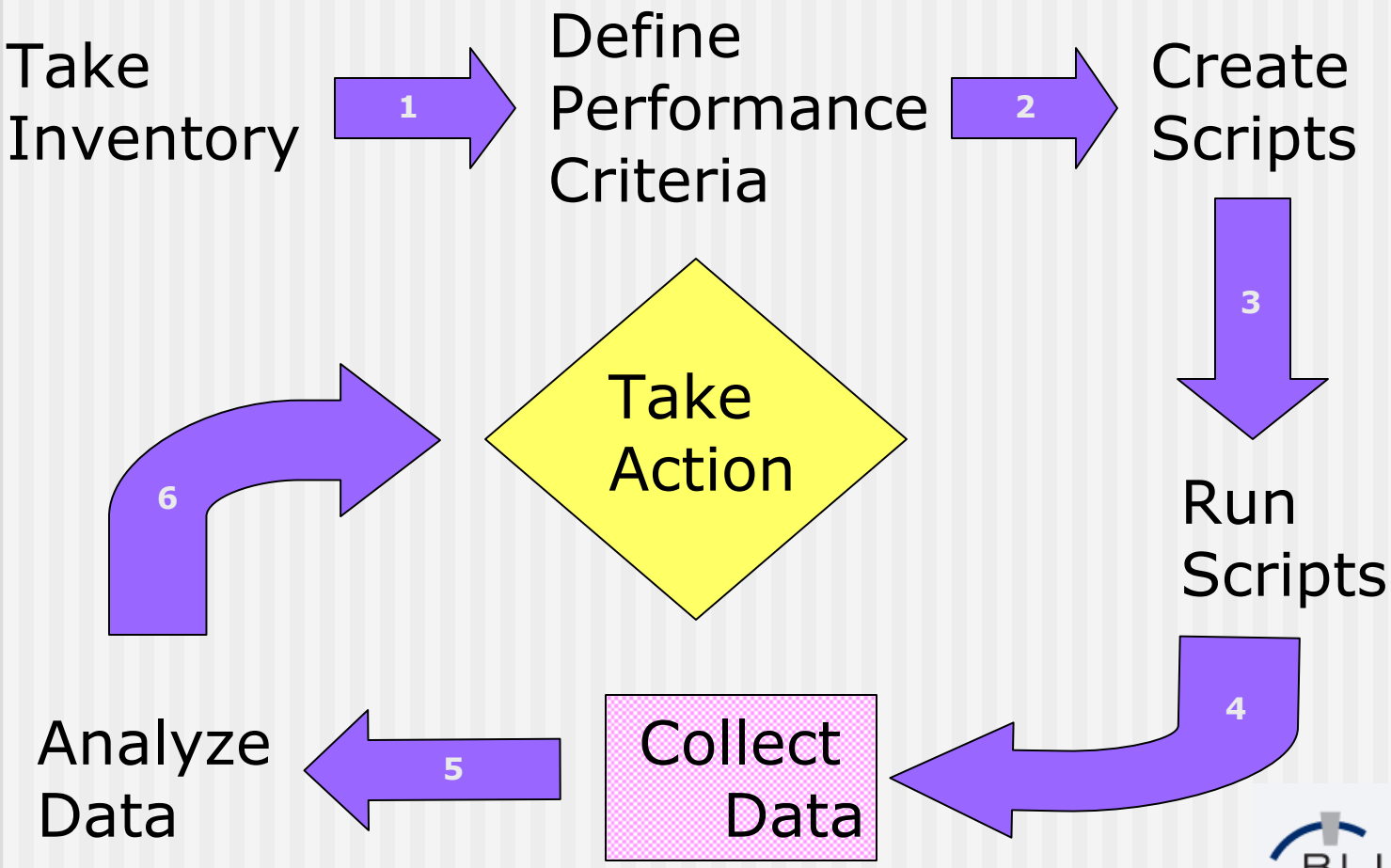
Running the Scripts

- Load simulation
  - Virtual users & client machines
- Centralized console
- Ramp up
- Ramp down

5. Collect the Data



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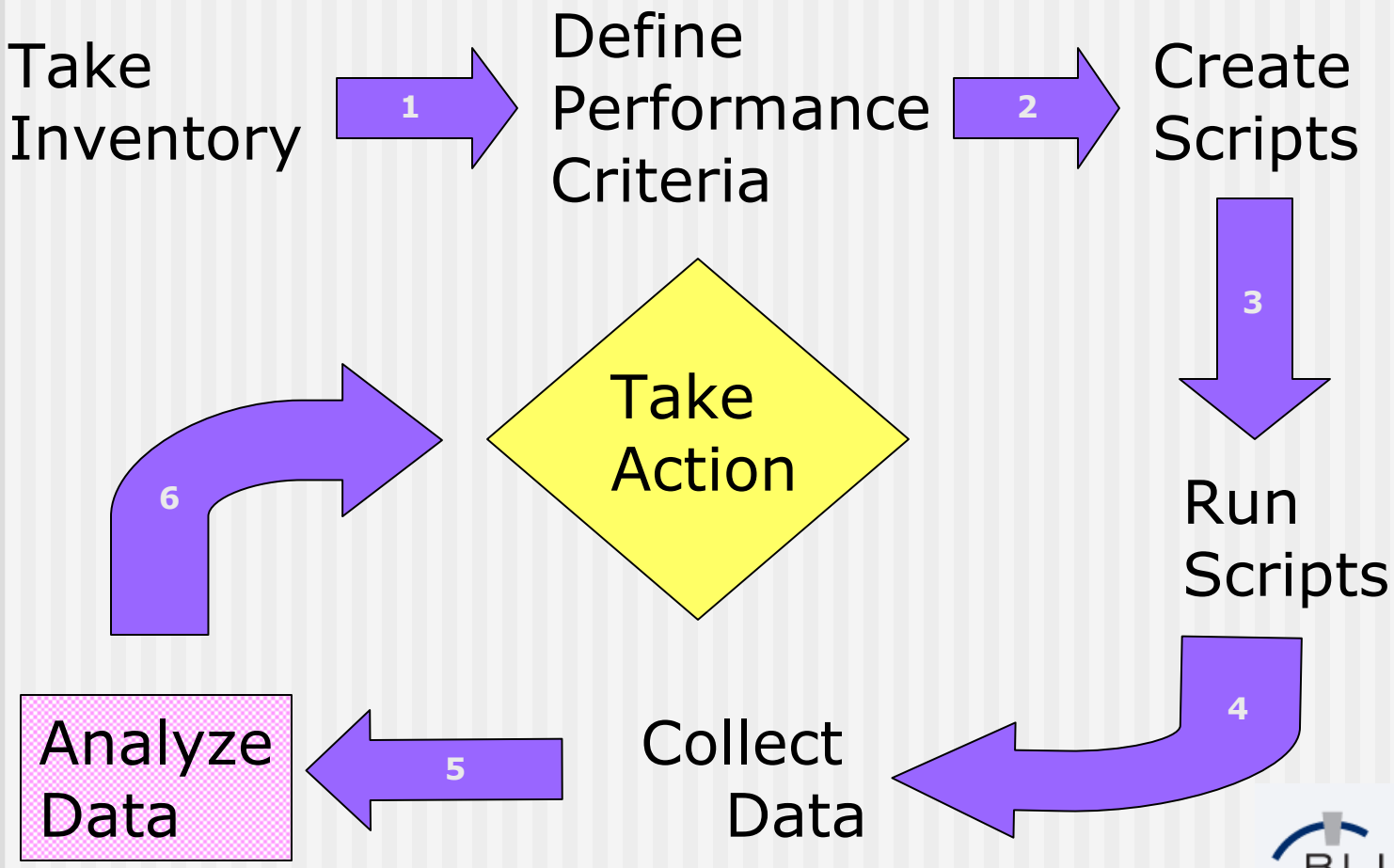
Collecting the Data

- Sampling methods
  - Cycle method
    - All virtual users execute the same number of complete cycles
    - Duration of test runs are **not** explicitly known
  - Snapshot method
    - Virtual users execute the test scripts for a fixed period of time
    - Duration of test runs are explicitly known

6. Analyze the Data



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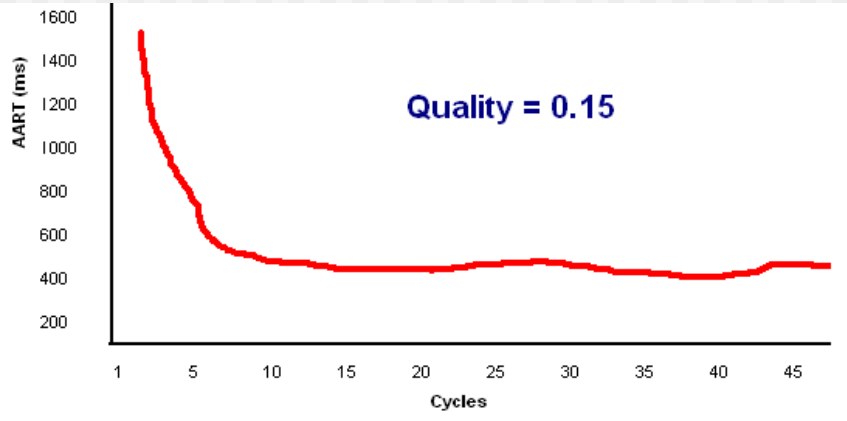
Analyze the Data – Terms

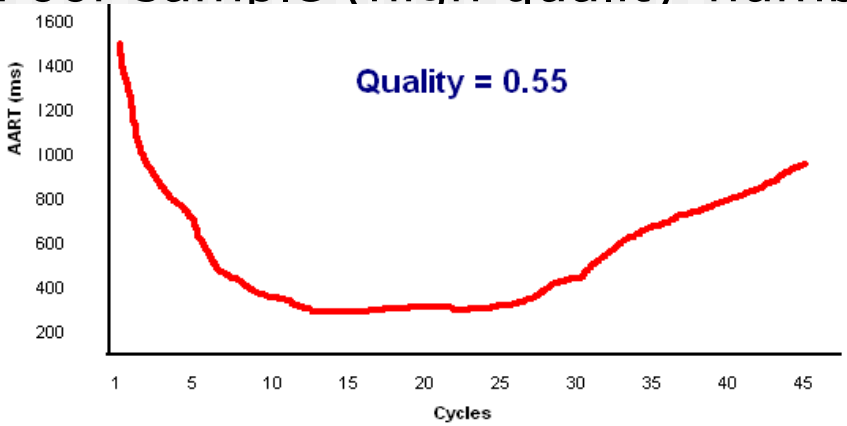
- Average Response Time (ART)
- Overall ART
- Total ART
- Aggregate ART (AART)
- Overall AART (load-factor)
- Maximum ART
- Sample Quality

Analyze the Data – Samples

- Good sample (low quality-number):



- Poor sample (high quality-number):



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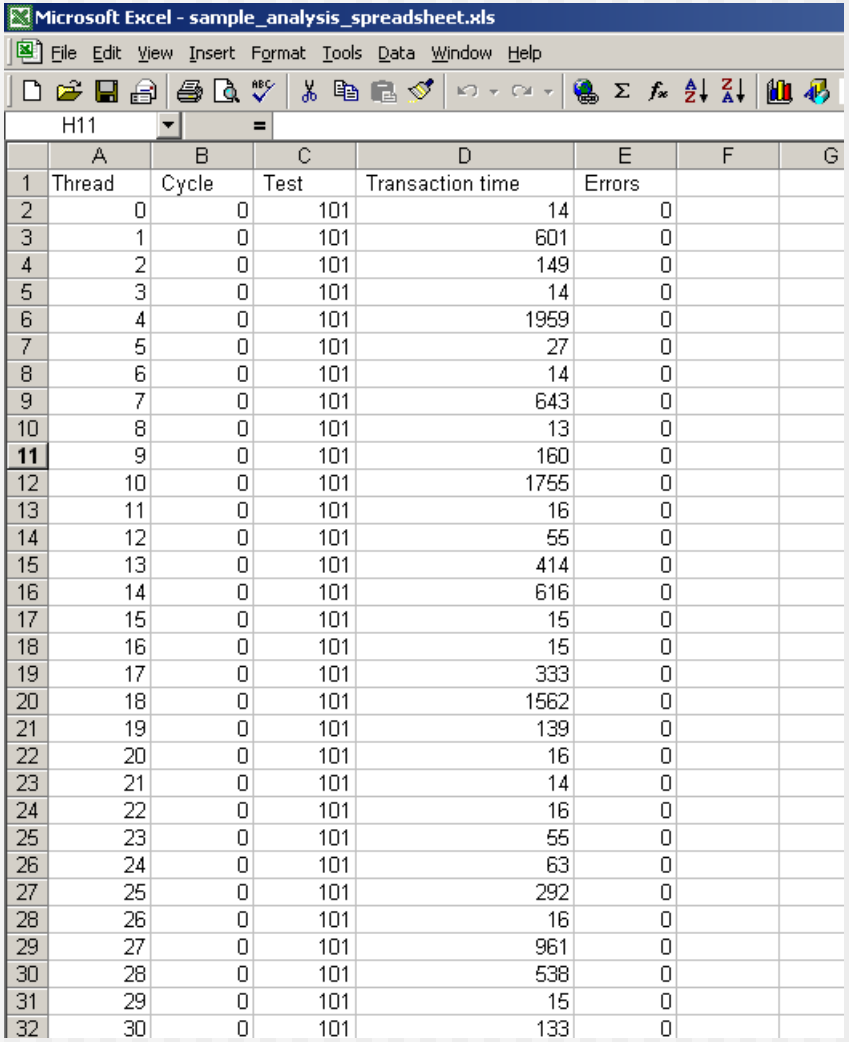
Analyze the Data, 1 of 4

- Form intuitive statements regarding application performance
- Exclusion of data
  - Omit beginning cycles to factor-out application initialization
  - Needed to achieve acceptable sample quality
- Import data into data-analysis tool (e.g., Excel)
  - Use pivot tables and graphs to aggregate and communicate results

Analyze the Data, 2 of 4


Microsoft Excel - sample_analysis_spreadsheet.xls

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H11 =

	A	B	C	D	E	F	G
1	Thread	Cycle	Test	Transaction time	Errors		
2	0	0	101	14	0		
3	1	0	101	601	0		
4	2	0	101	149	0		
5	3	0	101	14	0		
6	4	0	101	1959	0		
7	5	0	101	27	0		
8	6	0	101	14	0		
9	7	0	101	643	0		
10	8	0	101	13	0		
11	9	0	101	160	0		
12	10	0	101	1755	0		
13	11	0	101	16	0		
14	12	0	101	55	0		
15	13	0	101	414	0		
16	14	0	101	616	0		
17	15	0	101	15	0		
18	16	0	101	15	0		
19	17	0	101	333	0		
20	18	0	101	1562	0		
21	19	0	101	139	0		
22	20	0	101	16	0		
23	21	0	101	14	0		
24	22	0	101	16	0		
25	23	0	101	55	0		
26	24	0	101	63	0		
27	25	0	101	292	0		
28	26	0	101	16	0		
29	27	0	101	961	0		
30	28	0	101	538	0		
31	29	0	101	15	0		
32	30	0	101	133	0		

Each Grinder process will produce a data-file that can be easily imported into excel.

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Analyze the Data, 3 of 4

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A8 =

	A	B	C	D	E	F	G	H	I	J	K	
1												
2												
3												
4				**Aggregate ARTs (used in charts on summary page)**	752.6092437	281.3613445	179.7092437	154.5420168	124.0218487	101.3403361	114.5327731	
5				**Total ARTs per Cycle (used in above AART calculations and sigma calculation on summary page)**	12794.35714	4783.142857	3055.057143	2627.214286	2108.371429	1722.785714	1947.057143	1
6												
7	**Overall ARTs (displayed on summary page and used in "Total ART" calculation) omitting 1st first 5 cycles**		**Overall ARTs omitting 1st 5 cycles**	Average of Transaction time	Cycle							
8				Test	0	1	2	3	4	5	6	
9	23.92857143		23.52571429	101	314.8857143	20.02857143	16.48571429	104.2857143	52.02857143	30.11428571	18.6	2
10	12.108		13.68	102	144.2857143	7.057142857	5.771428571	7.685714286	40.82857143	10.42857143	9.571428571	6
11	209.2114286		201.5371429	103	324.4571429	186.2285714	191.9428571	216.8571429	187.5142857	201.8285714	323.3142857	1
12	15.512		11.93028571	104	362.6857143	21.08571429	11.88571429	11.22857143	9.885714286	21.6	11.08571429	1
13	253.1491429		245.6354286	105	1606.485714	486.6	444.7714286	295.4571429	245.1142857	281.6857143	271.2857143	2
14	24.30971429		21.53371429	106	3147.714286	410.8285714	264.6	32.05714286	27.77142857	38.4	23.31428571	
15	192.3354286		195.0331429	107	418.8285714	254.9428571	266.3714286	208.0857143	212.5428571	204.8857143	198.2857143	1
16	15.756		17.53371429	108	518.0571429	47.82857143	78.2	24.17142857	18.94285714	51.6	28.17142857	1
17	217.0571429		211.9234286	109	327.8285714	621.9428571	225.2285714	206.8	215.1142857	202	211.7142857	2
18	21.77828571		20.08571429	110	160.2	443.9714286	23.85714286	19.68571429	79.25714286	17.77142857	21.74285714	1
19	183.86		180.0011429	111	415.3142857	229.2285714	188.7142857	191.9714286	314.7714286	185.6285714	179.5714286	1
20	19.93485714		14.63085714	112	408.9714286	73.11428571	22.71428571	51.08571429	85.82857143	15.77142857	12.6	2
21	398.4091429		387.5977143	113	2056.914286	1101.171429	661.3142857	675.8285714	475.0571429	418.3714286	547.2571429	5
22	53.97428571		57.744	114	1982	580.4	229.3714286	137.9714286	45.85714286	39.97142857	51.14285714	6
23	14.95371429		15.40114286	115	68.51428571	60.17142857	11.88571429	51.6	69.37142857	11.34285714	15.57142857	3
24	13.68971429		13.58285714	116	41.8	105.6	11.51428571	42.68571429	17.42857143	13.08571429	14.25714286	9
25	13.59257143		15.75771429	117	83.28571429	7.857142857	61.02857143	20.37142857	8.685714286	10.34285714	11.25714286	3
26				Grand Total	728.3663866	274.0033613	159.7445378	135.1663866	123.8823529	103.2252101	114.6319328	1
27					12382.22857	4658.057143	2715.657143	2297.828571	2106	1754.828571	1948.742857	1
28												
29				Average of Transaction time	Cycle							
30				Test	0	1	2	3	4	5	6	
31			24.33142857	101	298.3142857	21.85714286	21.91428571	50.71428571	30.48571429	17.57142857	25.31428571	
32			10.536	102	220.5142857	5.714285714	9.114285714	6.371428571	17.22857143	11.71428571	6.914285714	5
33			216.8857143	103	372.8285714	191.9428571	193.7714286	363.7142857	178.2285714	201.1428571	240.9714286	
34			19.09371429	104	453.2571429	9.514285714	11.28571429	52.97142857	9.285714286	9.942857143	12.57142857	9

Analyze the Data, 4 of 4

Microsoft Excel - sample_analysis_spreadsheet.xls

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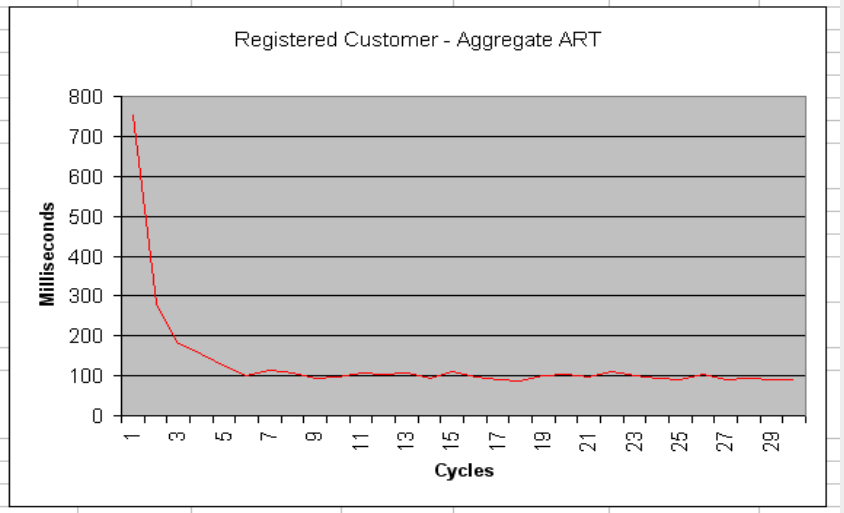
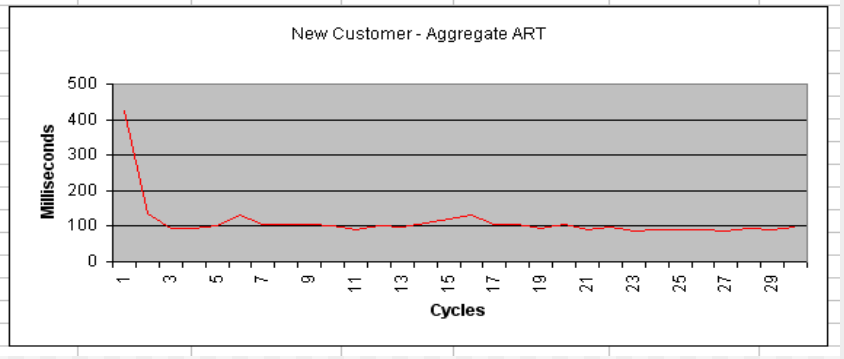
D12 =

	A	B	C	D
1	**E-Pizza (Chapter 5)**			
2	Sun JDK 1.3.1-b24 HotSpot Client			
3	WebLogic 6.1 SP2			
4	30 Cycles excluding first 5			
5				
6		**Registered**	**New**	
7	**Overall Aggregate ART**	**99.03**	**101.36**	
8	**Total ART (omitting first 5 cycles)**	1683.56	1925.81	
9	**Overall Maximum ART**	***398.41***	***430.28***	
10	***Users***	***70***	***30***	***100***
11				
12	**Sigma (standard deviation)**	128.24	236.04	
13	**Sigma/Mean (sample quality)**	***0.076***	***0.123***	
14				
15	**Overall ARTs per Requests omitting first 5 cycles:**			
16	Request 1	23.93	27.97	
17	Request 2	12.11	12.33	
18	Request 3	209.21	195.00	
19	Request 4	15.51	11.64	
20	Request 5	253.15	183.25	
21	Request 6	24.31	19.43	
22	Request 7	192.34	252.86	
23	Request 8	15.76	26.72	
24	Request 9	217.06	198.07	
25	Request 10	21.78	14.72	
26	Request 11	183.86	197.30	
27	Request 12	19.93	27.23	
28	Request 13	398.41	203.29	
29	Request 14	53.97	18.85	
30	Request 15	14.95	430.28	
31	Request 16	13.69	75.19	
32	Request 17	13.59	11.30	
33	Request 18		11.83	
34	Request 19		8.56	





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Take-Aways

- Performance testing is an integral part of application testing
- As with all application testing, the time spent up front costs much less than time spent in production trying to pinpoint and fix bottlenecks

Grinder Take-Aways

- The Grinder is not limited to performance testing web applications. It can also be used to performance test:
  - Web Services
  - EJBs
  - Databases via JDBC
  - JMS Queues
  - More…

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Resources

- **The Grinder** [http://sourceforge.grinder.net]
- **J2EE Performance Testing** by Peter Zadrozny [ISBN: 1-904284-00-0]
- **Pathload** – open source tool for measuring throughput of network endpoints

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Q & A

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