

# Apdex Methodology Case Studies – Steps from Pilot to SLA

Apdex Symposium 2008  
December 9, 2008



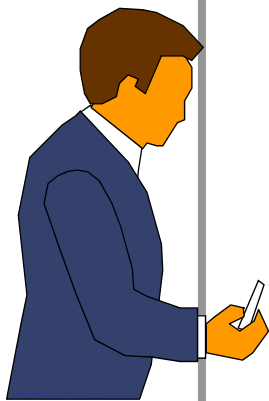
*Voice, Video and Data  
Application Performance Experts*

**Apdex Symposium, Las Vegas  
CMG Session 318**

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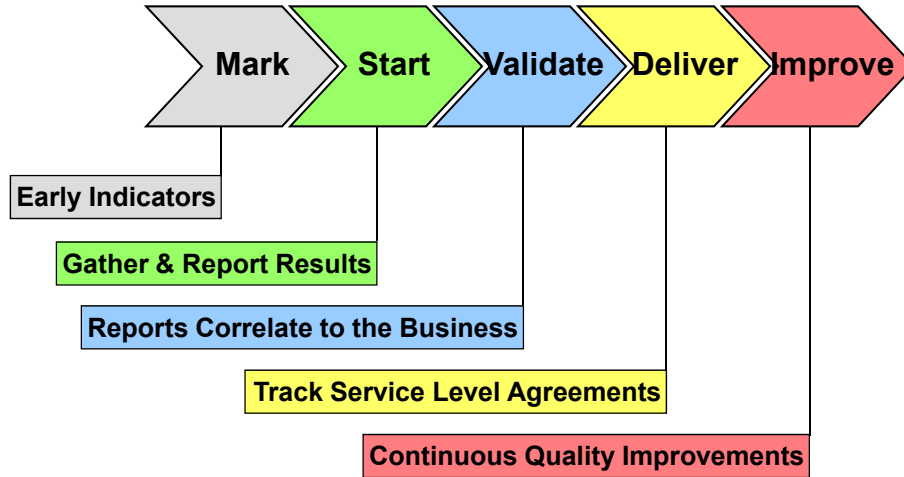
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## Outline



- **Apdex Implementation Process**
- **How to Set the Apdex T**
- **Setting T Case Study**
- **How to Use Apdex for an SLA**

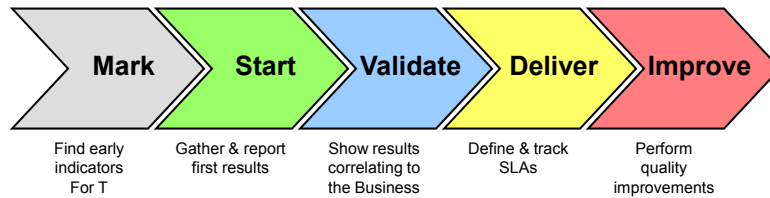
# Apdex Methodology



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Slide 3

# The Apdex Methodology

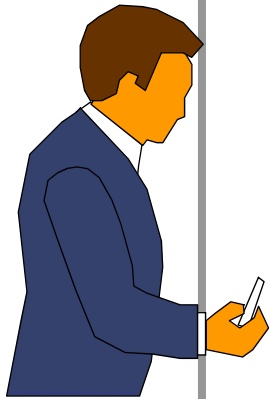


<b>Target T</b>	<b>T Markers</b>	<b>Initial T</b>	<b>Validated T</b>	<b>SLA Ts</b>	<b>SLA T</b>
<b>Report Group</b>		<b>Observed Users</b>	<b>General User Population</b>	<b>SLA User Groups</b>	<b>SLA Business Group</b>
<b>Apdex Goal</b>			<b>Initial Apdex Score Data</b>	<b>SLA Apdex Goals</b>	<b>Apdex Business SLA</b>

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Slide 4

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## Understanding Tasks



- **T is set by the Apdex report technician**
- **Focus the process**
  - Only need to understand a handful of tasks users perform very frequently
  - Only need to involve a few people
  - The combination of many Tasks and many opinions will sink the process!
- **Users really do use a few tasks repeatedly**
  - These are the tasks that will sway user satisfaction
- **Avoid unusual tasks**
  - Login is a special case that should probably not be studied

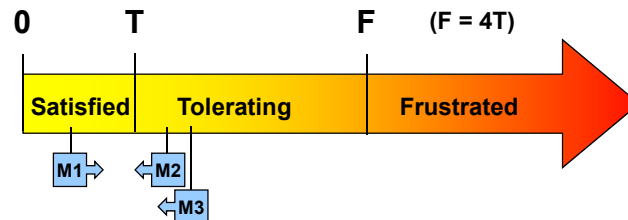
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## What is a T Marker?



### Performance Zone Boundaries



- A T Marker (TM) is an indicator of the user satisfied-tolerating boundary for an application
- Some T Markers have a greater than or less than property
- Multiple T Markers can be used to converge on an initial T value

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Slide 7

## T Marker Alternatives



1. Default Value
2. Empirical Data
3. User Behavior Model
4. Outside References
5. Observing the User
6. Controlled Performance Experiment
7. Best Time Multiple
8. Frustration Indicator
9. Interview Stakeholders
10. Mathematical Inflection Point

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## 1 – Default Value



- **The Apdex Alliance has defined a basic starting point for T of 4 seconds**
  - All tools will ship with a default setting of T that will be selected by the tool vendor. The default enables the tool to begin supplying information with minimal set-up by the technician. It is recommended that the **default** target threshold value, **T, be set to 4 seconds**. Technicians have the ability to change this default setting as defined above.
    - Apdex Technical Specification, V1.1, January 22, 2007
- **This is generally viewed as a low T value**
- **So this marker should be viewed as:  
T is greater than 4**

## 2 – Empirical Data



- **Study information already in your organization**
- **Focus on a group of users**
  - **Measure task response times at well known locations (e.g., headquarters)**
    - Measure during the business day and study users at these locations
  - **Determine how well performance is meeting business needs**
  - **Find T that returns the proper Apdex for this *well studied* group**
- **Look across user groups**
  - **Determine the task response times for different regions of the world**
  - **Correlate help desk calls with response time measurements**
  - **Are the users in Asia complaining about a response time of X while users in New York do not complain with their response time of Y?**
  - **T is between Y and X**

## 3 – User Behavior Model



- **How users set their performance expectation**
  - A user is prepared to invest time to receive information from a computer in direct proportion to the time he or she will spend processing that information
  - The user has a preset expectation for their processing time when he or she requests the data
- **There are two factors that determine how much time the user puts into the preconceived personal data processing budget:**
  - Interest: number of objects, fields, sentences the user will notice or read
  - Repetitiveness of the session or process

## Counting Interest Elements



- **One**
  - Simple check box
  - One data entry field: enter part number
- **Few**
  - Select among the following options
  - Expected few lines: headers of recently arrived email
- **Several**
  - Type your first name, last name, address, phone number
  - Information on product, prices, shipping alternatives, etc.
    - The user will typically only be interested in a few of these information fields, do not assume if you present 20, the user will read 20
- **Many**
  - Interesting report that is read
  - Scrolling down the page for more content

## Rating Repetitiveness



- **Very High**
  - There are many short tasks to the process
- **High**
  - There are a few tasks to the process
- **Low**
  - Sometimes there are a few tasks, sometimes there is browsing
- **Very Low**
  - The user is browsing, there is no actual process being performed

## Satisfied-Tolerating Threshold



*User is satisfied if task completes by T seconds*

Number of Elements Viewed

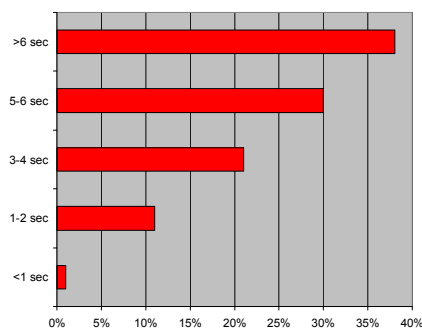
	1	2	3	4
Very Low	4	8	12	16
Low	3	6	9	12
High	2	4	6	8
Very High	1	2	3	4

## 4 – Outside References



- Find other sources of T from outside your organization
- Ask others what T they are using for you type of application and environment
  - The Apdex Alliance runs the Apdex Exchange user group where people can post questions about using Apdex

## Jupiter Research Study



- Detailed survey of Web retail users
  - 572 broadband users in survey
  - June 2006
- Question: “Typically, how long are you willing to wait for a single Web page to load before leaving the Web site?”
- Study conclusion is that Web pages should load in less than 4 seconds
- User answers to these kind of questions are often misleading

## NetForecast Past Cases



NetForecast has applied the Apex methodology in several projects with the following customer accepted selection of T  
Number of Elements Viewed

	1	2	3	4
Very Low	4	8 Web Browsing eCRM	10 12 CIES	16 FTP 2MB
Low	3 eTrans	6	9 MAPI	12
High	2 SAP	4 SCM eShop	6 B-B Web	8
Very High	1 SNA	2	3 CRM	4

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## 5 – Observing the User



- There is no substitute for understanding your users
- Find an experienced user of the application
- Ask them to perform a set of typical tasks they perform daily
  - The user will often really perform a process with several tasks in a series (task chain)
  - Ask the user to perform each step (task) at a slow pace (lots of time between each step)
  - It is often easy to get the pauses between each step by having the user describe each step (the talking slows them down)
- Observe the screen
  - Sit along-side the user with a stop watch
  - Time each step (task) from seeing "enter" to "screen refreshed"
  - Keep the watch out of the user's view
  - Take notes after each series of tasks
  - Or you can use a packet sniffer (e.g. Ethereal) to get the timings
- Observe the user
  - Notice the user's body language
    - Is she fidgeting while waiting for the system to respond?
    - Is she rolling her eyes?
    - Does she complain, "See that? It is too slow"
  - At the end of each process (task chain) ask the user if the system was responding at a typical pace
  - Ask if it ever gets slower or faster

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## User Observations Summary



- **At the end of the session with the user, quickly summarize the conclusions**
- **Typical tasks performed**
- **Typical response times**
  - **What looked like a “good enough” times (<T)**
    - These are often the times where the user stops the narration and just does the next step (she is focused on the process and jumps to the next step)
  - **What looked like a “not focused on the process” times (>T)**
    - Body language indicators
  - **What looked like a “frustrating” times (>4T)**
    - Body language or statements of complaints
- **Integrate several observation sessions**
  - **Perform the user observations with more than one user**
  - **Have more than one person perform the observations**
  - **Discuss the conclusion among the observers**
  - **Integrate the observations into a single good T Marker (in this case T=TM)**

## 6 – Controlled Performance Experiment



- **Slow down response time for a group of users and track what happens**
  - **This can be done to some production users**
    - Variation on #2 empirical data theme
    - Example: slow down apps at headquarter to look like a remote location
  - **Or to a limited well observed group**
    - Variation on #5, observing the user
    - Example: slow down apps in the user training room
- **Adding response time can be implemented by adding time in a server or adding a network simulation device between servers and users**
- **This process must be cleared with management but the users can't be informed ahead of time**
- **Process requires good instrumentation**
  - It only provides good data about frustration (Y) if the user group is being well monitored
  - Task response time must be accurately measured before and after the experiment
- **Calculate the T Marker**
  - Measurements are used to find Y
  - T Marker = one quarter of Y
  - $T < Y/4$

## 7 – Best Time Multiple



- **Find the fastest typical response time**
  - Measure real users, or
  - Perform a set of tests from a real user desktop
- **Measure task response time at a “good performance” location**
  - Headquarters
  - Well connected location (high bandwidth and physically close to data center)
- **Avoid measurements**
  - In the data center (no real user sees this performance)
  - Congestion (known periods of slow performance)
- **Determine baseline value X**
  - Average the measurements
  - Result = the application is rarely faster than X
- **Calculate the T Marker**
  - T Marker = X plus 50%
  - $T > 1.5X$

## 8 – Frustration Indicator



- **You may not know how fast is fast enough but you may know how slow is too slow**
- **Look for clear indications of too slow**
  - People complain at Y
  - A business manager reports, “productivity really slows down at Y seconds response time”
  - Industry survey of user actions at some time periods
  - **Filming user behavior**
    - There are many sources of video observations of users interacting with the system where Y can be measured
    - Pumping gasoline
    - Using an ATM machine
- **Calculate the T Marker**
  - T Marker = one quarter of Y
  - $T < Y/4$

## 9 – Interview Stakeholders



- **Talk to many people that have a stake in the specific application performing well**
  - Business manager
  - User
  - Application developer
- **Ask several questions all dealing with two issues:**
  - How fast is fast enough?
  - How slow is too slow?
- **Calculate T Marker**
  - The results of the polling will vary greatly
  - The values are typically too low compared to the actual value of T
  - Integrate the results into two values X=fast, Y=slow
  - T Marker = the mid-point between X and Y
  - $T > (X+Y)/2$

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Slide 23

## 10 – Mathematical Inflection Point

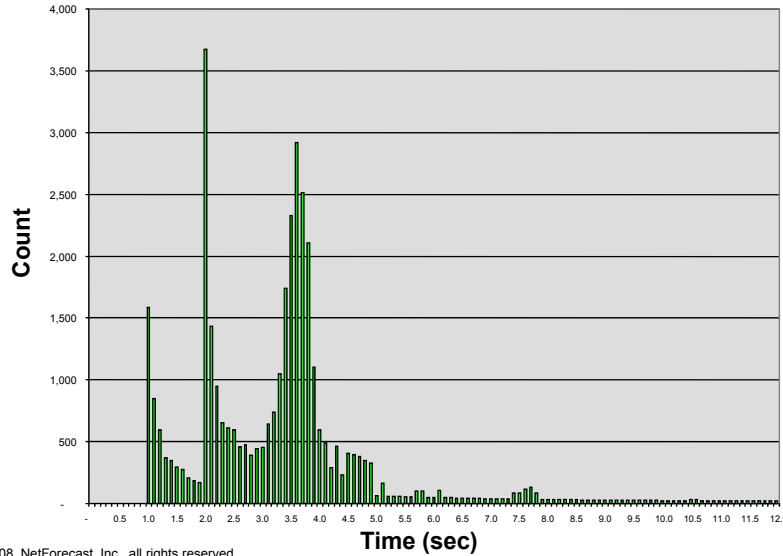


- **Measure a single application over time**
  - The application is generally performing well
  - Gather many task response time values
  - Limit the data set to the business day
- **Calculate Apdex for a range of T values across the data set**
- **Calculate T Marker**
  - Plot the results of Apdex versus T
  - Calculate the varying slope of the Apdex curve
  - There will be a few places where the curve has a high slope
  - T Marker = first inflection point (high slope) nearest the highest T
  - $T > T_M$

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Slide 24

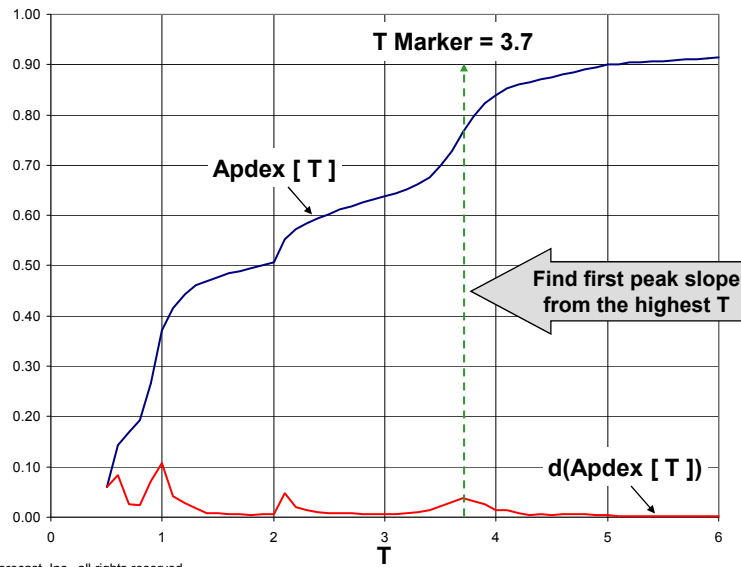
## Example Set of Measurements



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## Apdex Versus T



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## Two Ts for Two Goals



Emergency Room

### Tactical

- Keep the metrics tight so you can see any slight change
- Assume that the change is a “problem” that must be “fixed”
- Investigate the small change by drilling down to the cause
- Fix it if you can
- If you can’t fix it, call it a non-problem

CDC Center for Disease Control

### Strategic

- Keep the metrics reasonable but relaxed so you can see major changes
- Don’t assume anything about the change until you can detect a pattern
- Investigate the pattern by combing through more data
- Find an answer to the pattern if you can
- Implement a change if the pattern indicates a negative trend
- If you can’t explain the pattern, call it a non-event

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## Review of the T Markers



### Tactical

- Default Value
- Best Time Multiple
- Mathematical Inflection Point
- Outside References

Best used  
With synthetic  
measurements

### Strategic

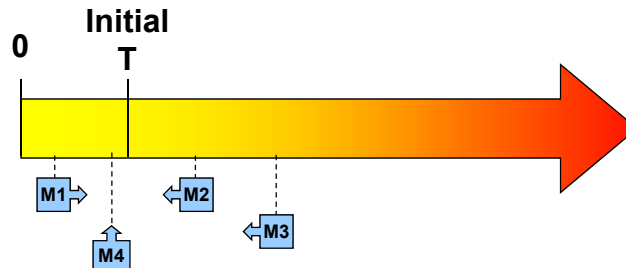
- Empirical Data
- User Behavior Model
- Observing the User
- Controlled Performance Experiment
- Frustration Indicator
- Interview Stakeholders
- Outside References

Best used  
With real user  
measurements

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Slide 28

## Using T Markers to Select Initial T



- Collect more than one T Marker
- You may have to throw out a TM that conflicts with all the others
- Find a good value that makes sense given the evidence gathered
- This is the Initial T

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Slide 29

## Validating T

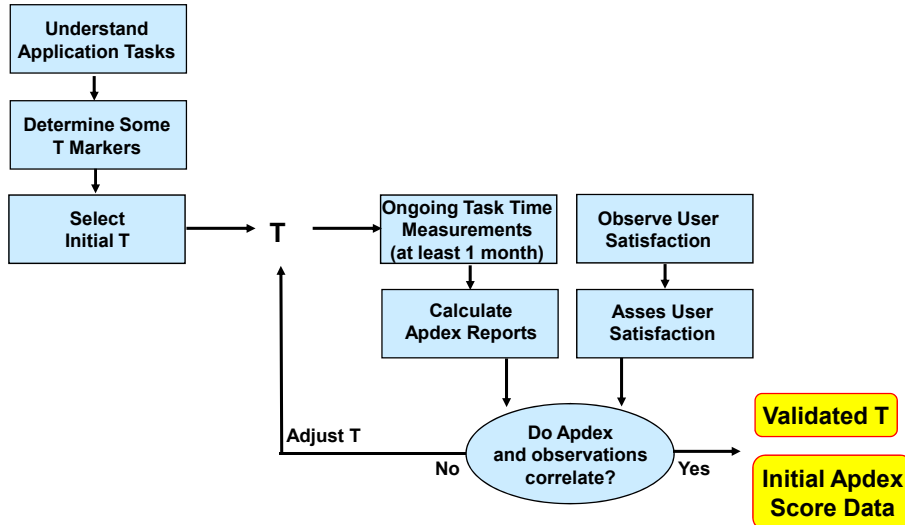


- Reporting application performance to management requires some more rigor
- Measure the application using the Initial T
  - Acquire a history of at least a month of data
  - Track Apdex results
  - Track user conditions
  - Track business conditions
- Do the Apdex values really show the user experience performance with the application?
  - Adjust T across the historic data until you can say yes

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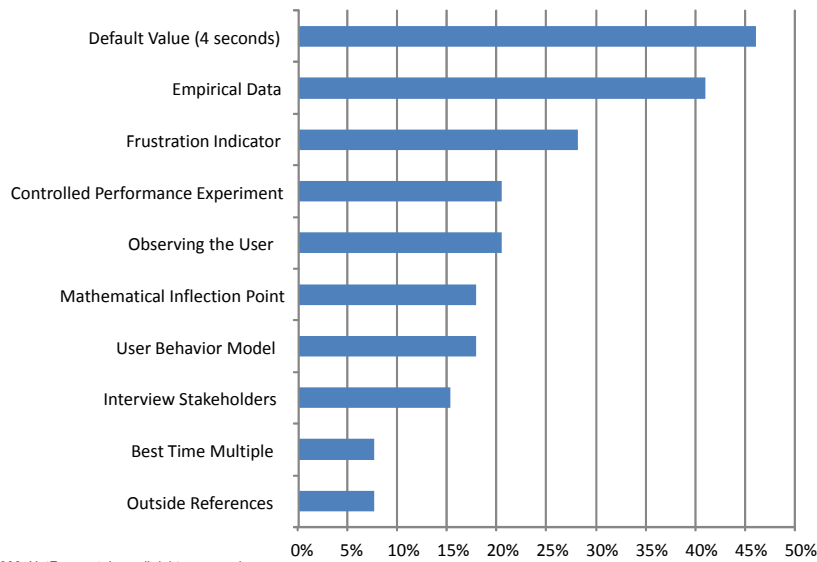
## Process for Setting the Apex T



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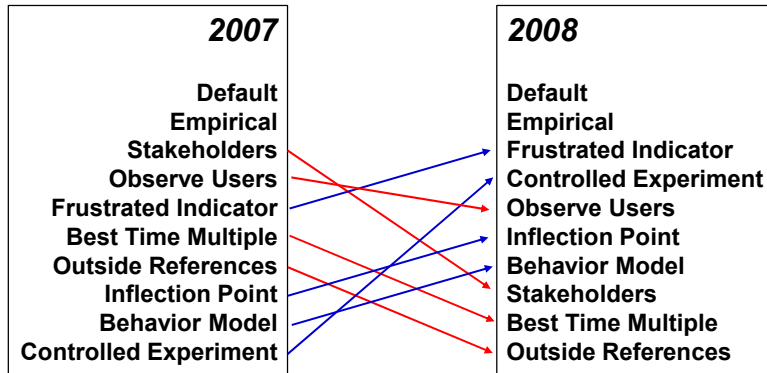
## How Apex T Marker is Set 2008 Apex User Survey



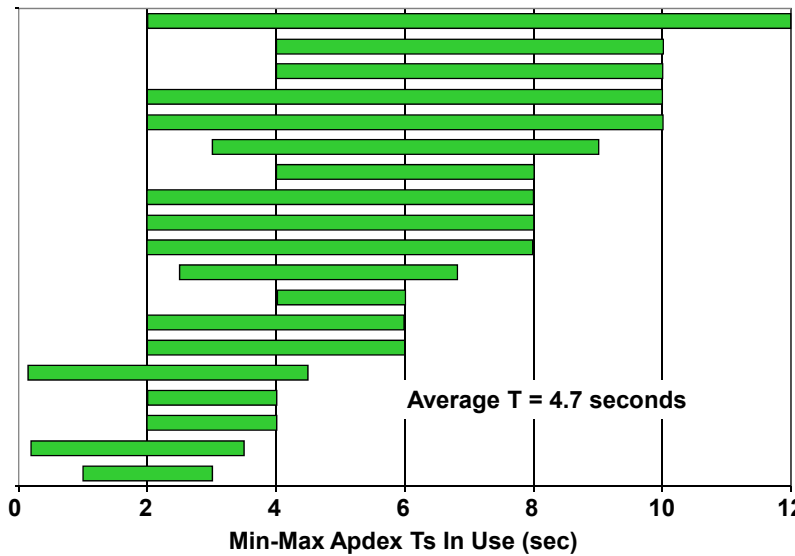
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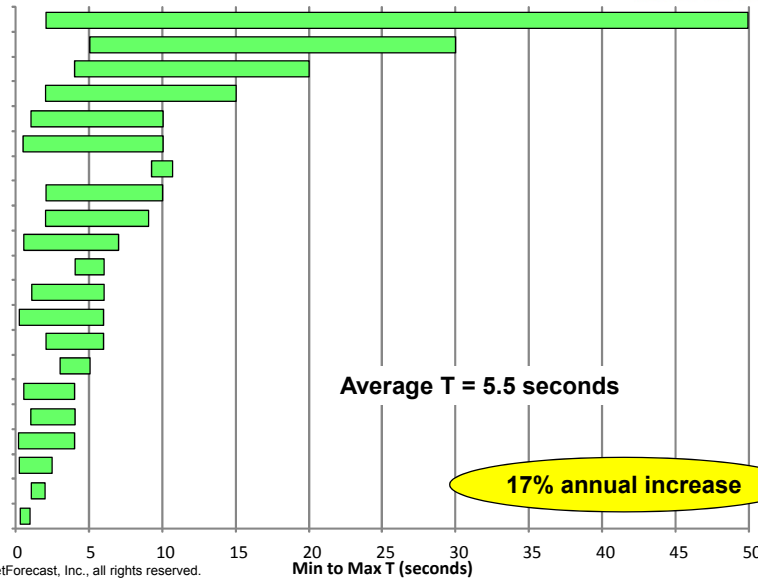
# Shifts in Popularity



# 2007 Range of Apex T in Use



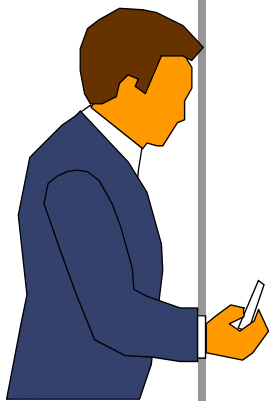
## 2008 Range of Apex T in Use



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Slide 35

## Outline



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## T Marker Alternatives



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## Initiation T Selection Process



- **Interview Stakeholders**
  - Ahead of workshop meeting
  - Performed an on-line survey
    - Data center staff, network staff, business managers
- **Mathematical Inflection Point**
  - Ahead of workshop meeting
  - Measure the key tasks using a synthetic agent service
    - Gather data for two weeks
  - Perform the inflection point analysis on each web service
- **User Behavior Model**
  - During workshop put posters on the walls with scales
    - Number of elements viewed
    - Task repetitiveness
  - Have attendees vote on each scale for each web service
    - Use colored dots

## Initial Ts Process Example



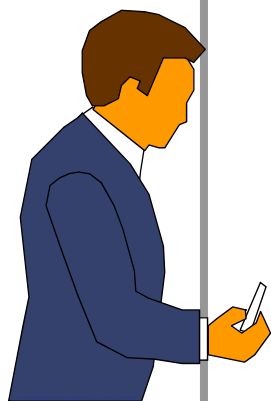
Circle # indicates setting T method	T Markers From Three Sources			Initial T Selection	
	9 Survey Targets	10 Measured (T Inflection)	3 Behavior Model Voting	T Markers Average	Consensus Initial Ts
Home	6.5	4.4	8	6.3	5
Search	2.7	1.3	2	2.0	2
My Page	5.8	2.9	6	4.9	5
Shopping	6.3	6.7	16	9.7	7
Community	12.4	10.4	9	10.6	9

Source: NetForecast, Inc.

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Slide 39

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Slide 40

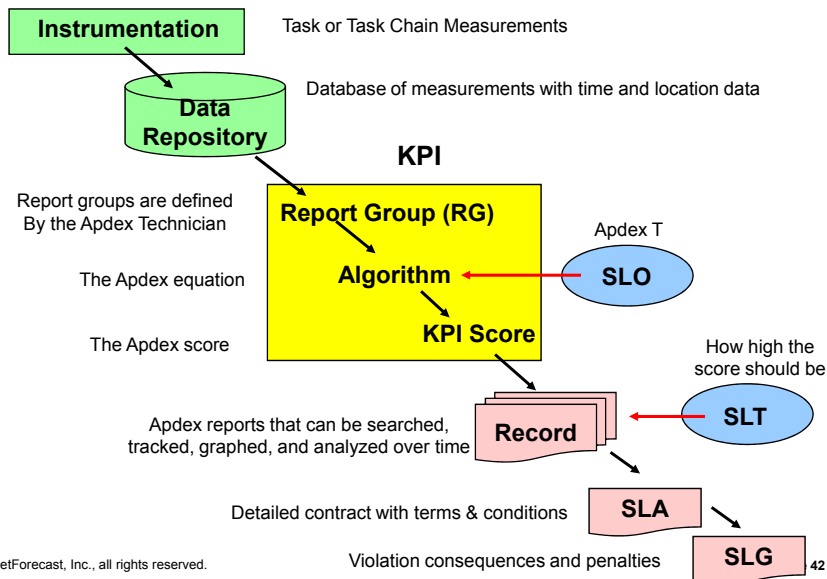
# Service Level Management



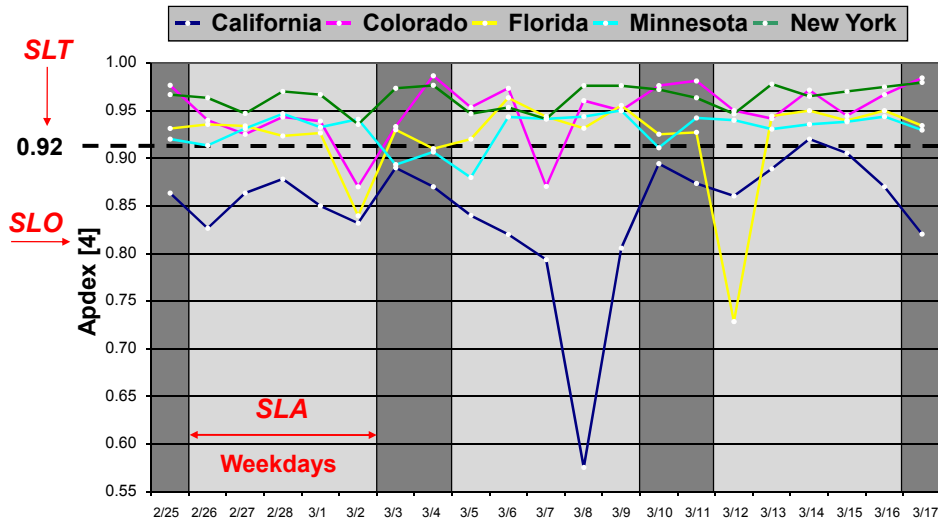
- **SLR – Service Level Requirement**
  - What the business needs
- **SLO – Service Level Objective**
  - Business need in IT terms
- **SLT – Service Level Target**
  - Service objective measured and aggregated
- **SLA – Service Level Agreement**
  - Terms and conditions added
- **SLG – Service Level Guarantee**
  - Warrantees and penalties added



# Apdex SLM Architecture



## Apdex SLA



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## The SLA Report



- **Reporting period**
  - There are 5 cities
  - 5 days per week
  - 3 weeks in the graph
  - Total is 75 city-days
- **Meeting the SLA**
  - 56 city-days were above the SLT within the SLA
  - Result: 75% compliant with the SLA
- **Meeting the SLG**
  - Does 75% compliance trigger penalties?

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# Thank You



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