PADOVA
EDITION

DELPHI DAY 2018

Delphi Performance Diagnostic

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DelphiDay
italian conference

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PADOVA EDITION

DelphiDay italian conference

wintech italia

AGENDA

→ Why is it important to measure?

→ The basics: The Now() function

→ Windows API to the rescue

→ System.Diagnostic and System.TimeSpan

→ TVirtualMethodInterceptor

→ 3rd party libraries

WHY IS IT IMPORTANT TO MEASURE ?

Your software is evolving

BUT…

in the right direction ?

EVOLUTIONARY ARCHITECTURES

"An evolutionary architecture supports guided, incremental change across multiple dimensions"

CHANGE

IS INEVITABLE

IF CHANGE

IS INEVITABLE THEN

GUIDED CHANGE

- We want to guide the change
  - Rather than suffer from it
- Introducing the “Fitness Functions”
  - From evolutionary computing
- The key is to measure everything
  - More on later

FITNESS FUNCTIONS

DEFINITION

“An architectural **fitness function** provides an objective integrity assessment of some architectural characteristic(s)”

FITNESS FUNCTIONS

- Fitness functions check that developers preserve important architectural characteristics
- But, what is better?
- Find a way to measure better
- Ok, but what is a FF in reality?

FITNESS FUNCTIONS

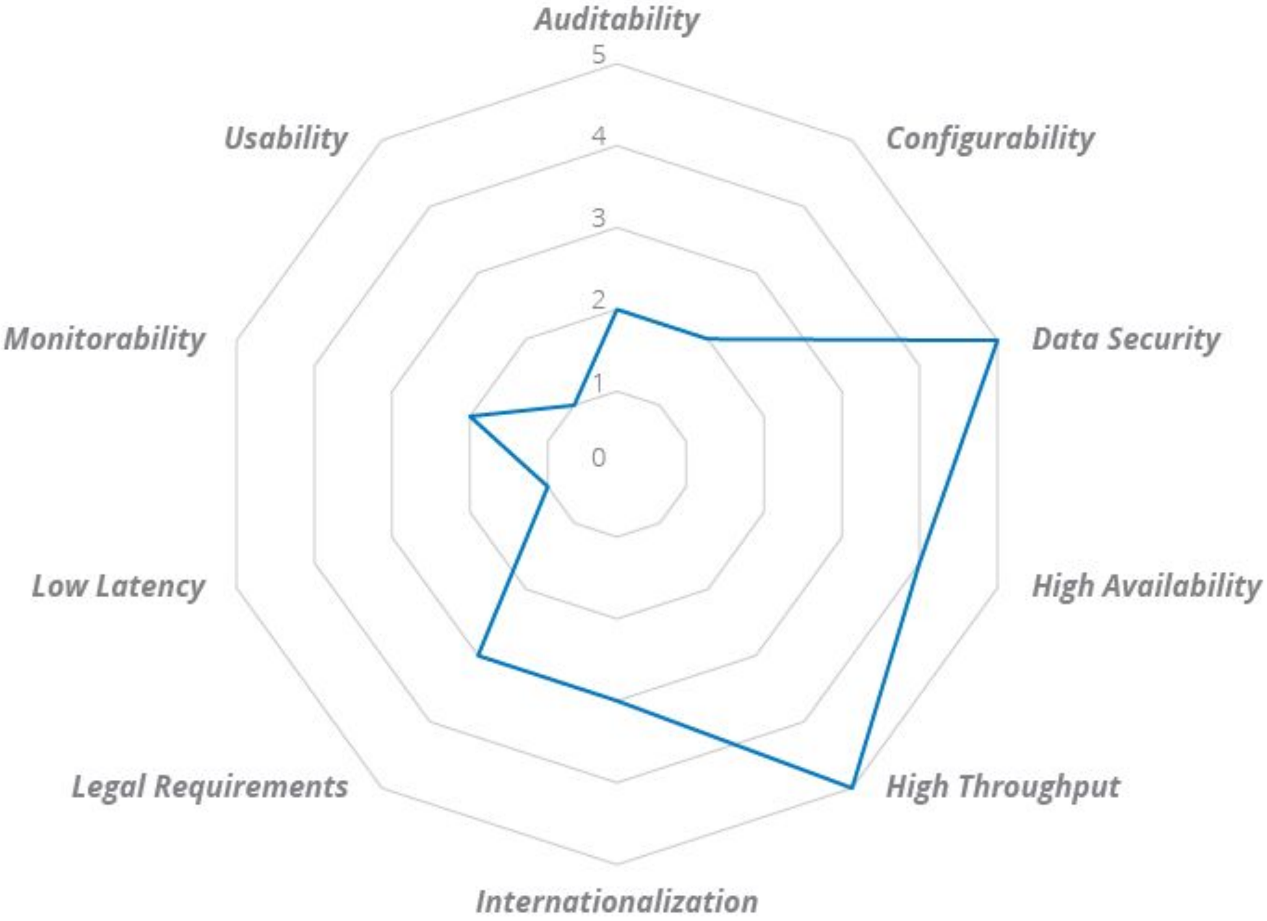
- Specific architectural requirements differ greatly across systems and organizations
- They are based on
  - Business requirements
  - Technical capabilities
  - Client needs
  - …

FITNESS FUNCTIONS

- Examples of FF:
  - Intense security
  - Low latency
  - Resilience to failure
- Remember the “-ilities”
- Fitness functions embody a protection mechanism for the “-ilities” of a given system

SYSTEMWIDE F.F.

- Collection of FF
- They help to “measure” the system as a whole
- There are **tradeoff**
  - Is more important the scalability or the security?
  - So


Auditability
Configurability
Data Security
High Availability
High Throughput
Internationalization
Legal Requirements
Low Latency
Monitorability
Usability
5
4
3
2
1
0

REAL WORLD EXAMPLES

- Performance
  - Server have to respond in 100ms
- Scalability
  - System must manage up to 100.000 sessions
- Coding standard
  - Cyclomatic complexity must be lower than 100
- Legal requirements
  - GDPR must be complied with

REAL WORLD EXAMPLES

- At every iteration we know how if the system remains closer the the goals
- Save the FF and look at them over time
- Introduce FF early (and often) to pick up inflection points
- Measure everything

WHY PERFORMANCE?

PERFORMANCE

→ Performance is important, everyone get that, even your boss!

→ Easy to measure

→ Easy to track

→ Easy to chart

LET'S START

THE BASICS

- The Now() function
  - Been there since Delphi 1
  - Very easy to work with
  - Doesn’t need an explanation!
  - Not very precise
    - The internal clock is (was) updated about every 55ms, which gives a maximum precision of 55ms

WINDOWS API

- GetTickCount() function
  - Very easy to use
  - Limited to 10-16 milliseconds resolution
  - DWORD (Cardinal) result, so every 49.7 days the counter resets
- GetTickCount64() function
  - Same as GetTickCount()
  - ULONGLONG (UInt64) result, so the counter resets every 584.942.417 years

WINDOWS API

- → QueryPerformanceCounter()
  - ◆ For accurate timing
  - ◆ Easy to use (but read MS docs)
  - ◆ High precision timer < 1ms
  - ◆ Used with QueryPerformanceFrequency() function
  - ◆ If the system doesn’t support a high resolution timer returns 0

WINDOWS API

- Summary
  - For long periods of time you can (must) use Now() or GetTickCount()
  - When you need high resolution timers (but for a brief period of time) you can use QueryPerformanceCounter()

THE DIAGNOSTICS UNIT

- TStopWatch record
  - Available only in (new) Delphi versions
  - It’s multiplatform
  - Resolution is < 1ms
  - Used with the TTimeSpan record

THE DIAGNOSTICS UNIT

- Useful properties/methods
  - Start method: starts the measuring
  - Stop method: stops measuring
  - ElapsedMilliseconds property: give you the total elapsed time (ms)
  - Elapsed property: give you the total elapsed time (ticks)
  - IsHighResolution property: tells whether the timer is a high-resolution counter

THE TIMESPAN UNIT

- TTimeSpan record
  - Available only in (new) Delphi versions
  - It’s multiplatform
  - Holds information about a period of time
  - Time can be measured in days, hours, minutes, seconds, milliseconds, and ticks
  - Several methods to convert, add, and match time periods

EXTERNAL TOOLS

- GpProfile (Primož Gabrijelčič)
- MemProof (Atanas Soyanov)
- AsmProfiler (André Mussche)
- Sampling Profiler (Eric Grange)
- ProDelphi (Michael Adolph)
- AQTime (SmartBear)
- SmartInspect (SmartInspect)

CONCLUSIONS

Know what you are measuring

Duration

Resolution

Number of counters

then choose the right tool

Now()

GetTickCount()

QueryPerformanceCounter()

TStopWatch

That's all Folks!