

Building Windows Phone 7 Applications

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Windows Phone Engineering

YOW!2010 Australia, December 2010



ADSHEL

"Everything's
different now."

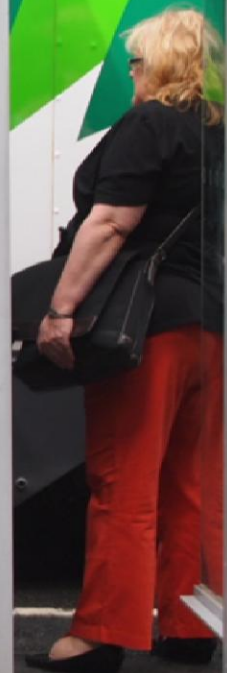
- Gizmodo



Windows Phone

Get the **htc 7 Mozart** now
Exclusive to Telstra

ADSHEL



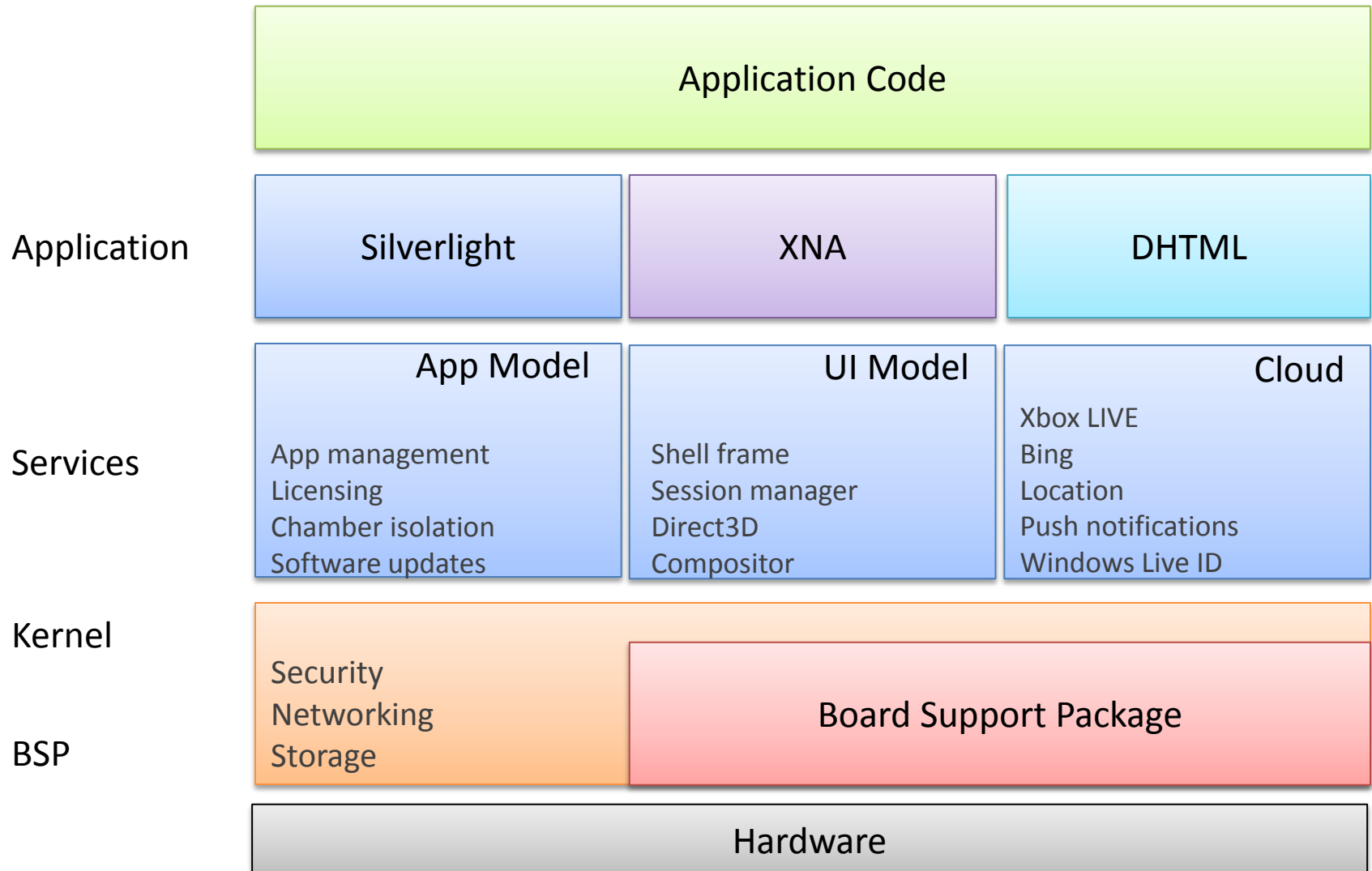
WP7 Code Demo

A WP7 APPLICATION

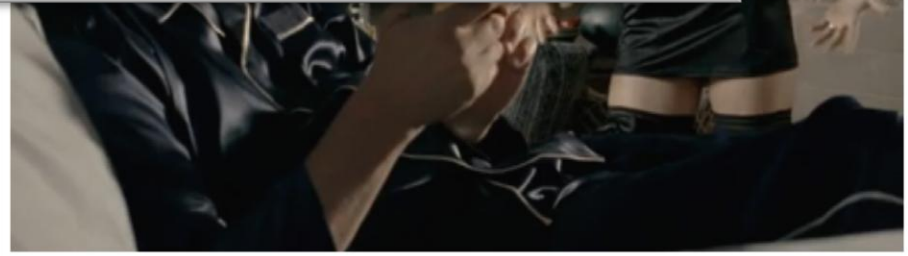
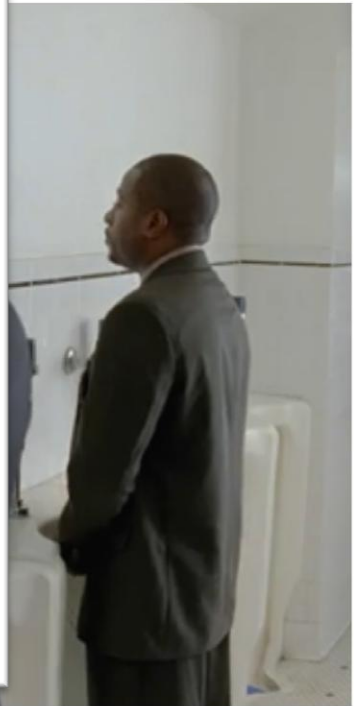
Developer Insights

- Familiar language and tools
- The power of .NET in your pocket
- Build and debug apps with(out) a device

WP7 Layered Architecture



A Personal Device



I: Application Model

- Own process, instance of the CLR
- Phone controls the application lifecycle
- Extensibility hooks

Application Startup Instrumentation

208.28ms	89.63ms	71.93ms	@TH.TaskHostStartedEvent	Memory:	0.25MB	Elapsed:	ms	ms
212.19ms	93.54ms	2.44ms	+TH.ResumeTaskHostBeginEvent	Memory:	0.25MB	Elapsed:	1285.95ms	441.50ms
212.19ms	93.54ms	2.44ms	+TH.StartTaskHostBeginEvent	Memory:	0.25MB	Elapsed:	1285.92ms	441.50ms
213.50ms	94.85ms	3.75ms	+TH.CreateWindowBeginEvent	Memory:	0.26MB	Elapsed:	1284.52ms	441.50ms
244.72ms	100.43ms	78.06ms	+TH.CreateXCPBeginEvent	Memory:	0.26MB	Elapsed:	1213.44ms	464.17ms
244.81ms	100.52ms	78.16ms	+TH.CoCreateInstanceBeginEvent	Memory:	0.26MB	Elapsed:	107.97ms	73.27ms
322.57ms	130.34ms	107.97ms	@SL.NpCtrlLoadDllEvent	Memory:	0.32MB	Elapsed:	ms	ms
352.75ms	135.19ms	112.82ms	@SL.ControlStartupEvent	Memory:	0.32MB	Elapsed:	ms	ms
352.78ms	135.22ms	112.85ms	+TH.AttachControlBeginEvent	Memory:	0.32MB	Elapsed:	1105.38ms	390.90ms
363.07ms	145.17ms	122.80ms	+SL.ControlInitializeBeginEvent	Memory:	0.34MB	Elapsed:	1095.03ms	390.56ms
501.92ms	251.77ms	229.40ms	+SL.CompositorCreationBeginEvent	Memory:	0.43MB	Elapsed:	48.68ms	23.59ms
564.94ms	288.85ms	265.23ms	+SL.DownloadRequestEvent	Memory:	1.26MB	Elapsed:	893.13ms	331.12ms
567.57ms	291.14ms	267.52ms	+SL.PutSourceBeginEvent	Memory:	1.27MB	Elapsed:	890.50ms	330.78ms
715.36ms	396.97ms	373.08ms	+SL.PutRootVisualBeginEvent	Memory:	2.85MB	Elapsed:	742.25ms	288.54ms
550.60ms	278.08ms	254.49ms	-SL.CompositorCreationBeginEvent	Memory:	1.25MB	Elapsed:	ms	ms
742.61ms	418.73ms	394.78ms	+SL.ClrStartupBeginEvent	Memory:	2.86MB	Elapsed:	477.91ms	92.62ms
744.38ms	420.50ms	396.55ms	+TH.GetPlatformProfileBeginEvent	Memory:	2.86MB	Elapsed:	8.06ms	0.27ms
1220.52ms	811.55ms	780.06ms	-SL.ClrStartupBeginEvent	Memory:	3.66MB	Elapsed:	ms	ms
1457.61ms	858.28ms	826.78ms	-SL.PutRootVisualBeginEvent	Memory:	3.79MB	Elapsed:	ms	ms
1458.07ms	858.73ms	827.24ms	-SL.PutSourceBeginEvent	Memory:	3.79MB	Elapsed:	ms	ms
1458.07ms	858.73ms	827.24ms	-SL.DownloadRequestEvent	Memory:	3.79MB	Elapsed:	ms	ms
1458.10ms	858.76ms	827.27ms	-SL.ControlInitializeBeginEvent	Memory:	3.79MB	Elapsed:	ms	ms
1458.16ms	858.83ms	827.33ms	-TH.AttachControlBeginEvent	Memory:	3.79MB	Elapsed:	ms	ms
1498.11ms	881.71ms	846.86ms	-TH.StartTaskHostBeginEvent	Memory:	5.39MB	Elapsed:	ms	ms
1495.88ms	879.49ms	844.64ms	@SL.SplashScreenDrawnEvent	Memory:	5.39MB	Elapsed:	ms	ms
1976.47ms	1284.21ms	1248.81ms	@TH.FrameInitialized	Memory:	5.63MB	Elapsed:	ms	ms
2011.14ms	1318.33ms	1282.93ms	@TH.NavigationServiceStarted	Memory:	5.63MB	Elapsed:	ms	ms
2136.23ms	1430.94ms	1393.62ms	+TH.PageNavigation	Memory:	5.67MB	Elapsed:	396.91ms	29.85ms
2257.81ms	1540.16ms	1502.14ms	@TH.PageInitialized	Memory:	5.82MB	Elapsed:	ms	ms
2533.14ms	1798.86ms	1760.68ms	-TH.PageNavigation	Memory:	6.43MB	Elapsed:	ms	ms

WP7 Code Demo

WP7 APPLICATION MODEL

Developer Insights

- App, Frame, Page; Navigation Service; hooks
- Full access to available resources
- Watchdog prevents long waits

Fluid Experiences

- Mobile apps
- Fast response times
- Modest hardware (compared with desktop)

WP7 Code Demo

SAVING AND RESTORING STATE

Developer Insights

- At most 10s to save state
- Background thread quantum when saving state
- Unlimited number of stateful applications

Sensitivity Point

Reading from Isolated Storage (DataContractSerializer, streamReader.Read)

9,962.98ms^P29T006 +KU411.0000 About to read object
10,015.47ms^P29T006 -KU411.0000 (ElapsedBeginToEnd Wct=52.49ms TctStall=33.63ms) Object read

9,029.82ms^P29T006 +KU411.0000 About to read object
9,032.75ms^P29T006 -KU411.0000 (ElapsedBeginToEnd Wct=2.93ms TctStall=0.00ms) Object read

Writing to Isolated Storage (DataContractSerializer, streamWriter.Write)

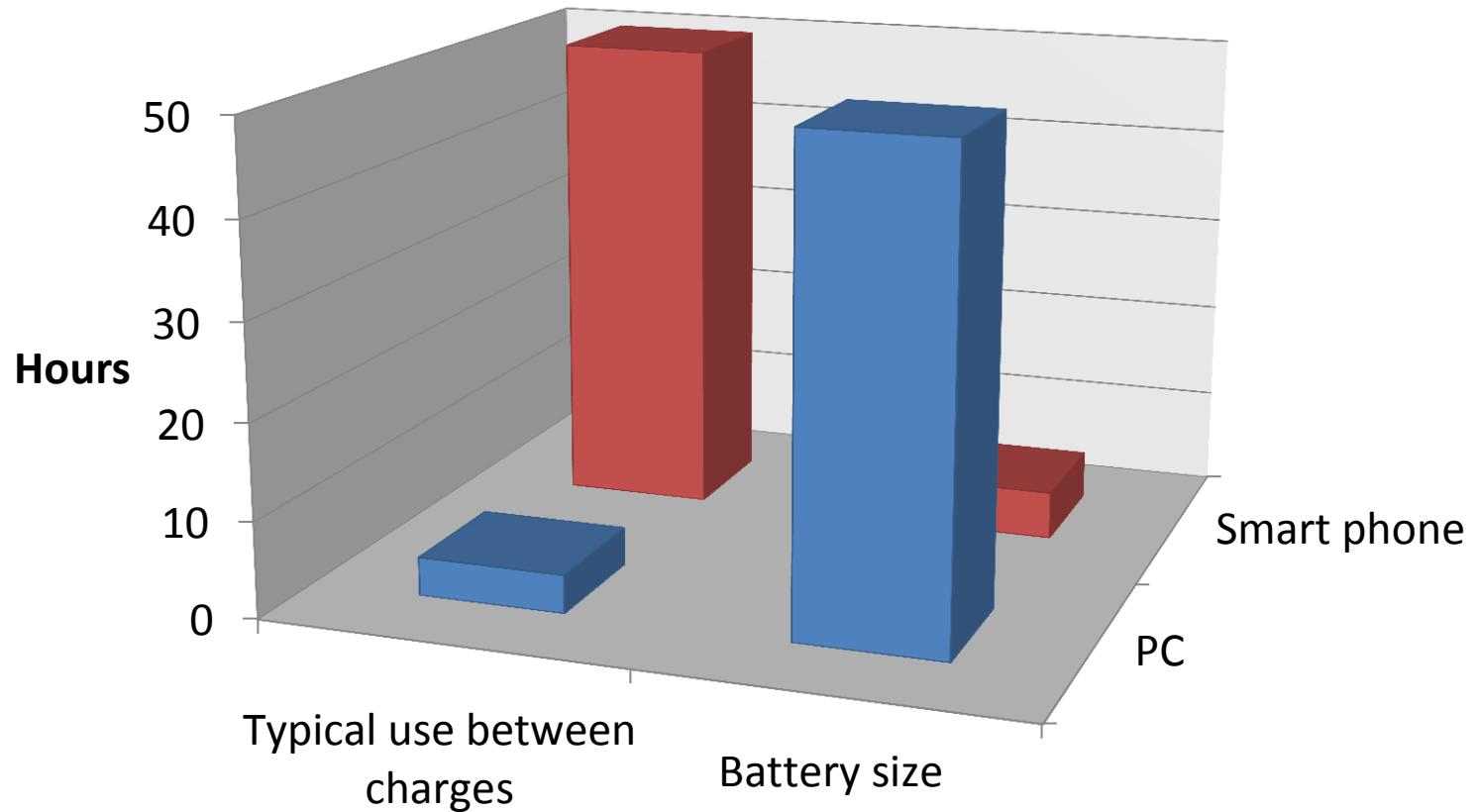
7,242.58ms^P28T000 +KU411.0002 About to save object
7,510.56ms^P28T000 -KU411.0002 (ElapsedBeginToEnd Wct=267.97ms TctStall=195.59ms) Object saved

6,188.32ms^P28T000 +KU411.0002 About to save object
6,380.00ms^P28T000 -KU411.0002 (ElapsedBeginToEnd Wct=191.68ms TctStall=140.96ms) Object saved

II: Power

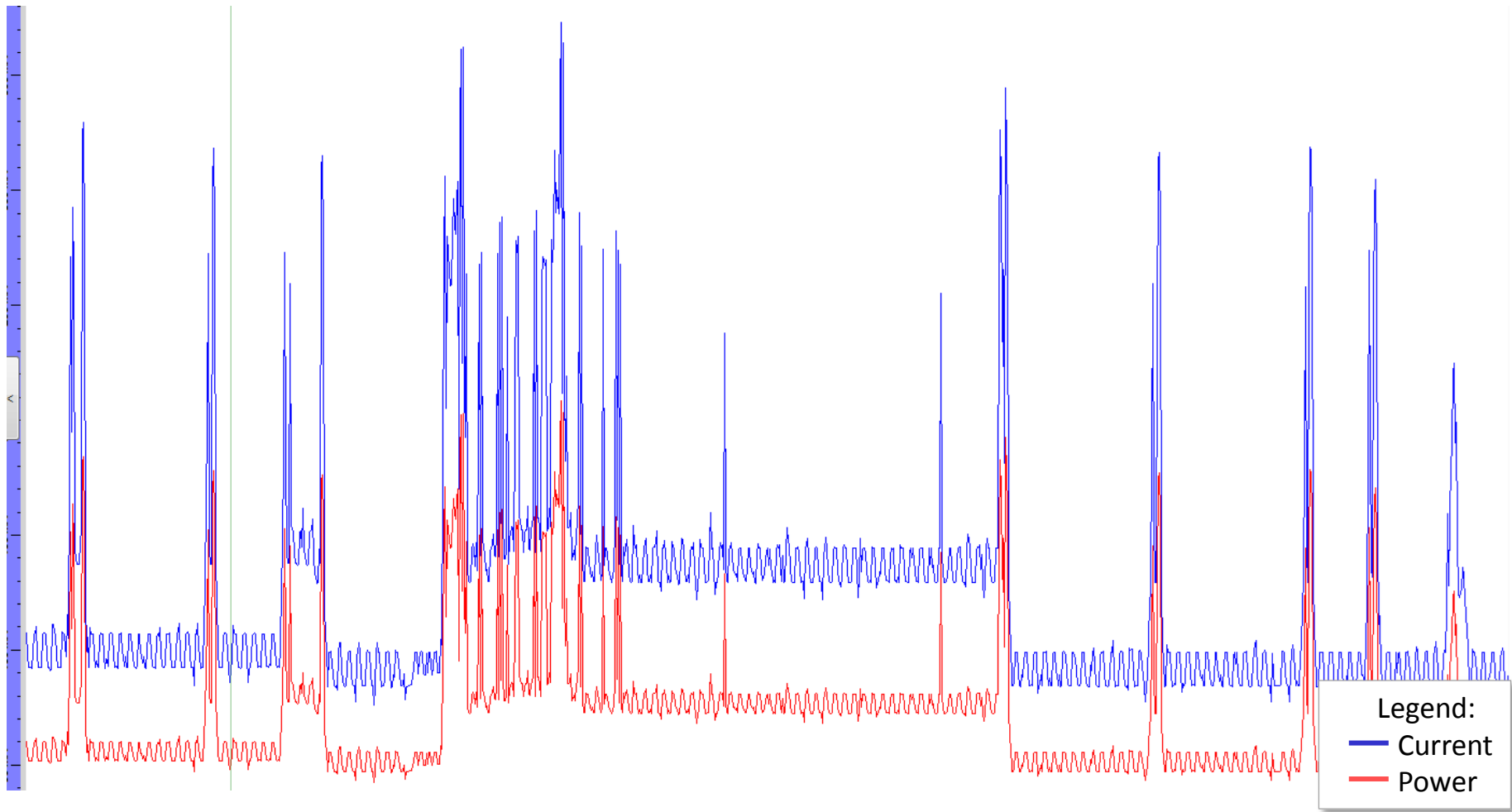
- Usage profile differs from other devices
- App CPU modes: full, SWFI, power collapse
- Everything costs power; really

Usage Profiles



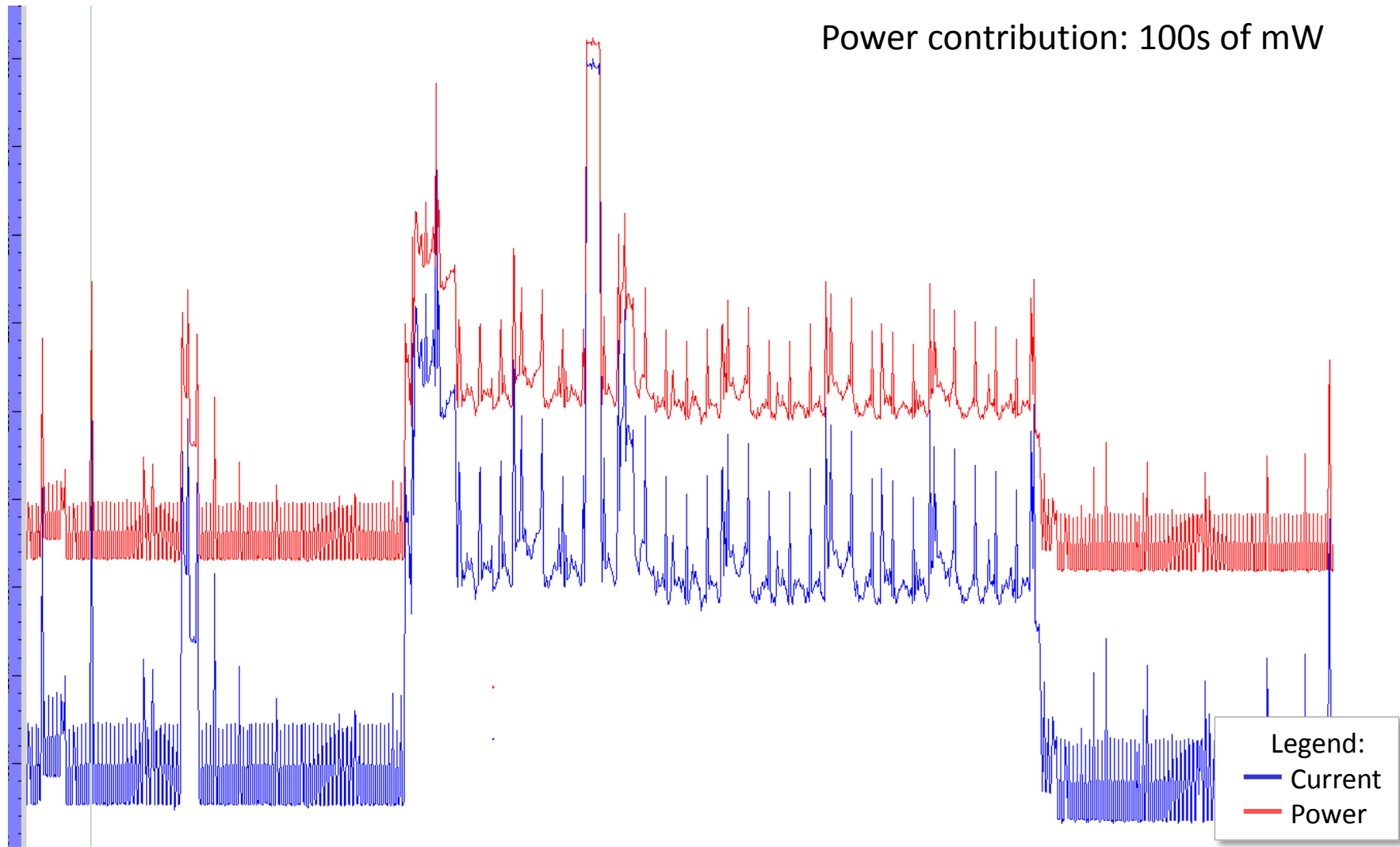
Touch Sensor

Power contribution: 10s of mW

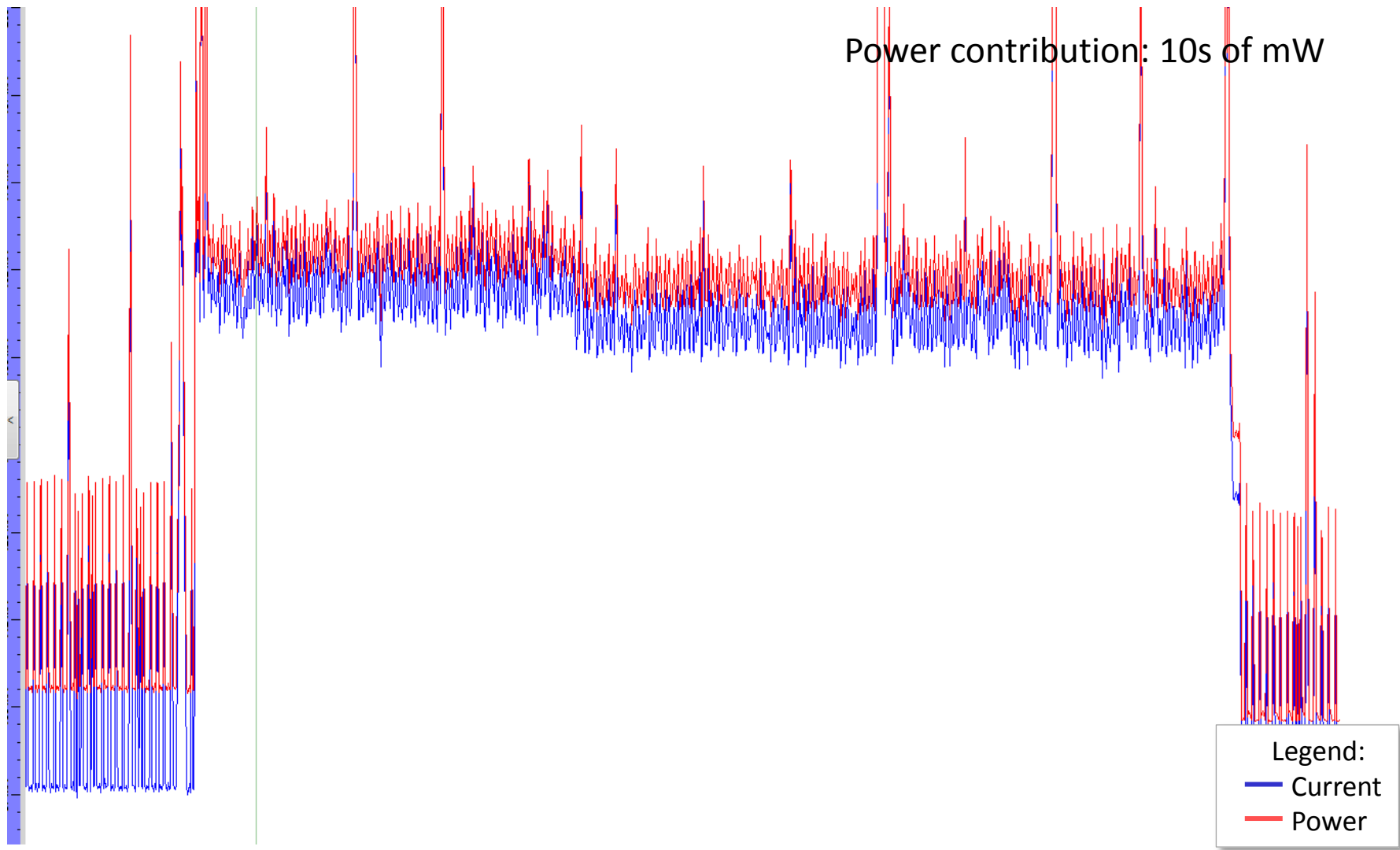


GeoLocation

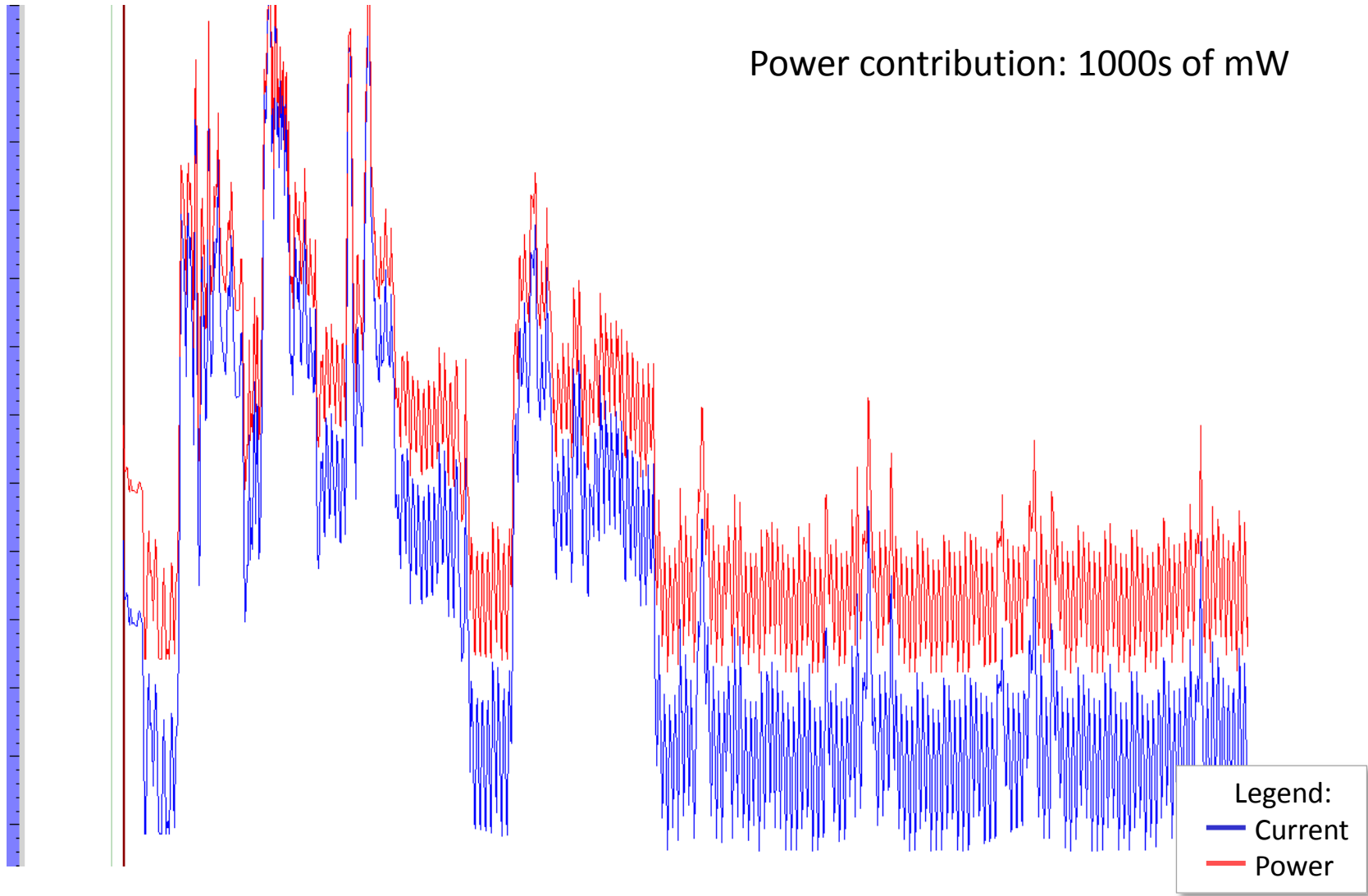
Power contribution: 100s of mW



Accelerometer



Network Request/Response



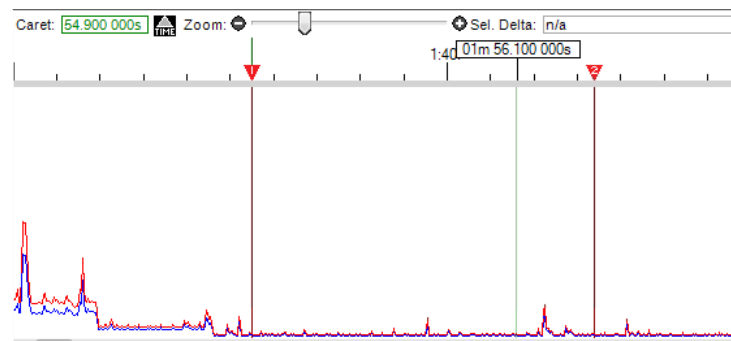
WP7 Code Demo

RUNNING UNDER LOCK

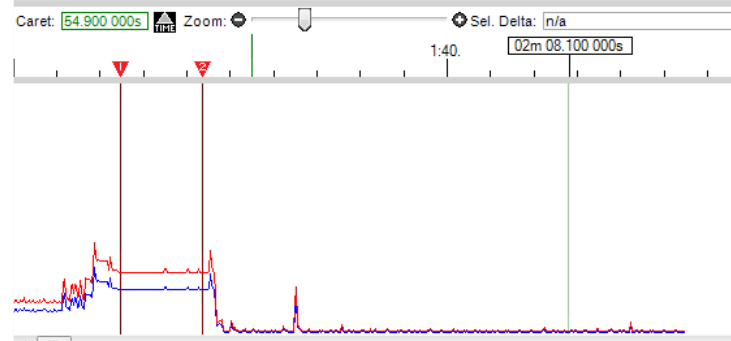
Developer Insights

- Run under the lock screen
- Silverlight:
 - Disable IdleDetectionMode
 - Stop DispatcherTimers, network, sensors
- XNA:
 - Disable IdleDetectionMode
 - Set InactiveSleepTime to 1s

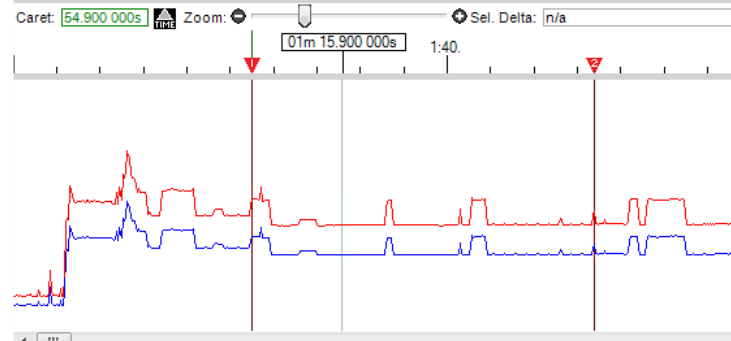
Silverlight, SWFI



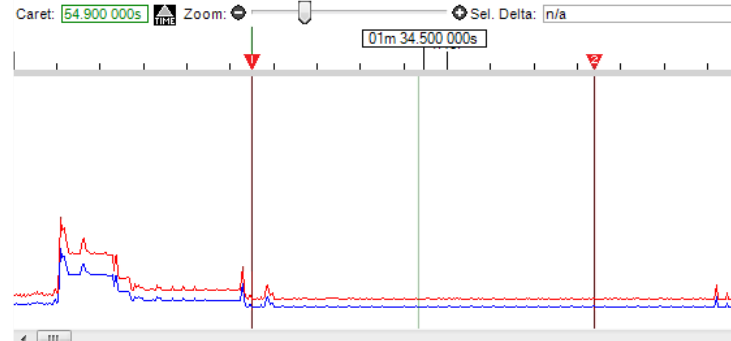
Silverlight, DispatcherTimer



Silverlight, high CPU



XNA



Legend:
— Current
— Power

III. Asynchronous/Event-Driven Programming

- Asynchronous world
- `IObservable<T>` mathematical dual of `IEnumerable<T>`
- Async computations as queries

WP7 Code Demo

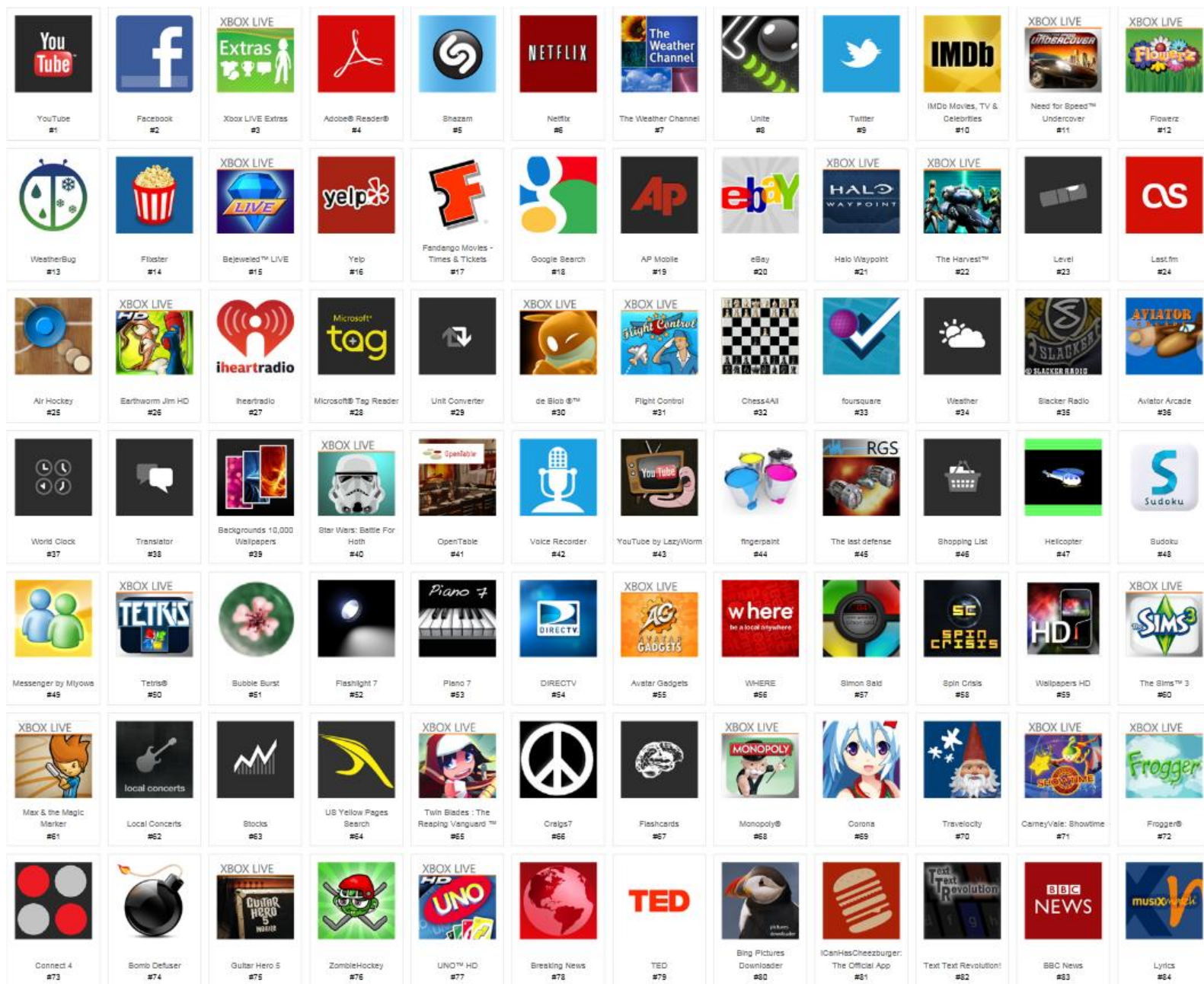
GEOFENCING WITH THE GEOLOCATION API

WP7 Code Demo

2D BUBBLE LEVEL WITH THE WP7 ACCELEROMETER API

Developer Insights

- Rx available on every WP7 phone
- Async computations as queries
- Queries evaluate lazily
- Mock event sources with ToObservable()



<http://bit.ly/bqERTb>

Summary

- WP7 applications
 - Phone controls their lifecycle
 - Component power profiles; run under lock
 - Async computations as queries
- Free development and design tools:
<http://create.msdn.com>
- MSDN docs: <http://bit.ly/cZWC7r>
- Programming Windows Phone 7, Charles Petzold; free e-book: <http://bit.ly/aljdj9>

THANK YOU!

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