# Sleep Study

+ Note: This report does not contain information for the first Connected Standby session.

COMPUTER NAME	SURFACE-PRO4-PE
SYSTEM PRODUCT NAME	Microsoft Corporation Surface Pro 4
BIOS	103.818.768 09/18/2015
OS BUILD	10240.16545.amd64fre.th1.150930-1750
PLATFORM ROLE	Mobile
REPORT TIME	2015-10-31 14:14:45

Connected Standby Transitions
Battery drains over the last 3 days
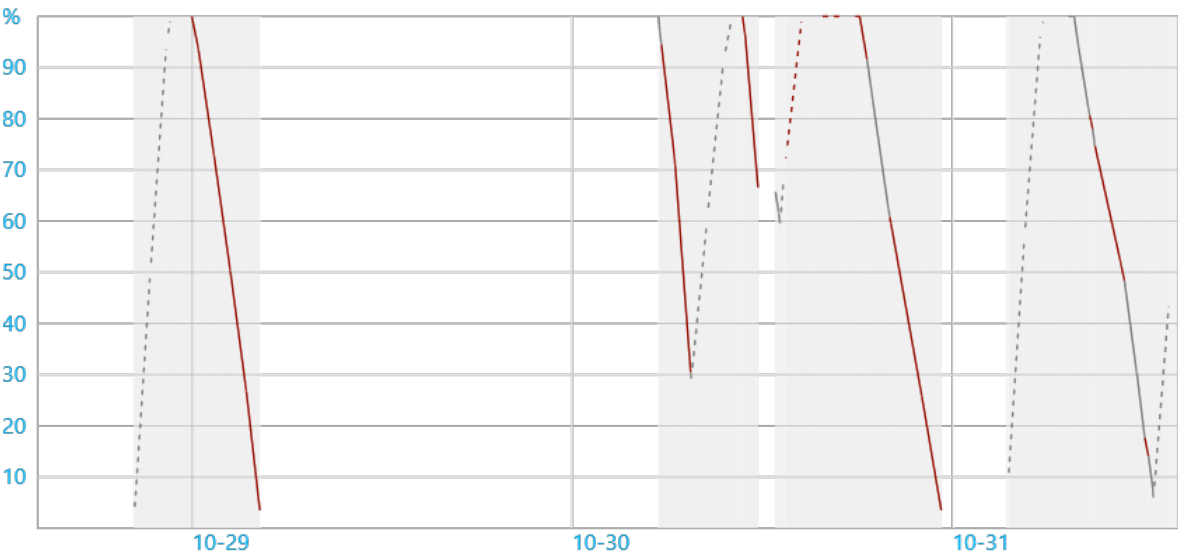
Legend

GRAPH LINE	DESCRIPTION
Dotted	AC power
Solid	Battery power
No line	System powered off
Grey	Active Scenario
Green	Low System Activity
Orange	Moderate System Activity
Red	High System Activity

	START TIME		DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME	
1	2015-10-28	23:58:42	4:17:47	38,466 mWh	97% of battery	8,956 mW	Drain (critical battery)	0%	HW: -
2	2015-10-30	05:37:56	1:51:01	24,680 mWh	64% of battery	13,347 mW	Drain	0%	HW: -

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME	
3	10:45:20	0:58:36	13,116 mWh	33% of battery	13,447 mW	Drain (thermal)	0%	HW: -
4	13:19:50	4:36:43	-	-	-	Charge	0%	HW: -
5	17:56:50	0:40:30	3,329 mWh	8% of battery	4,941 mW	Drain	0%	HW: -
6	20:03:08	3:15:18	22,596 mWh	57% of battery	6,945 mW	Drain (critical battery)	0%	HW: -
7	2015-10-31 08:40:48	0:11:12	1,027 mWh	3% of battery	5,547 mW	Drain	0%	HW: -
8	09:00:36	1:51:51	10,244 mWh	26% of battery	5,499 mW	Drain	0%	HW: -
9	12:09:24	0:14:04	1,394 mWh	4% of battery	5,982 mW	Drain	0%	HW: -

Analysis Results
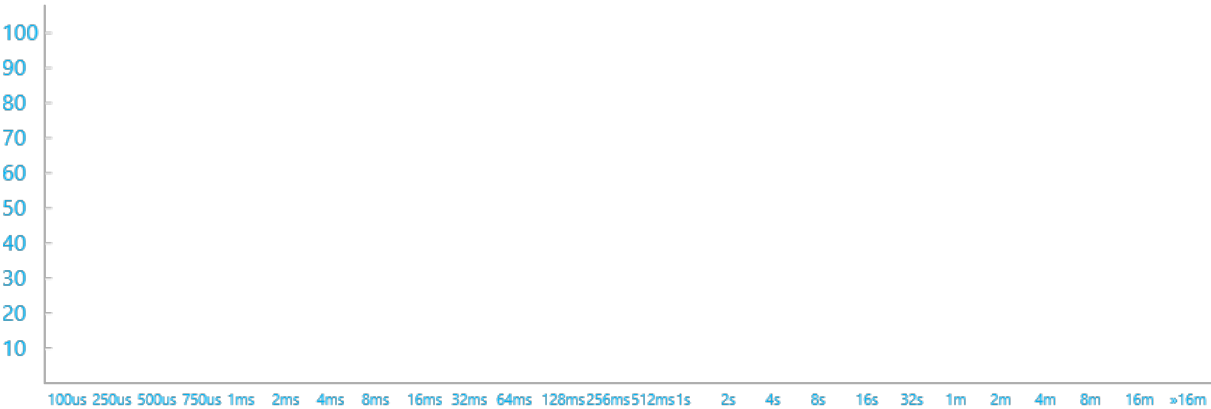
Analysis of issues that might cause poor battery life

Connected Standby Session 1

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME		
1	2015-10-28 23:58:42	4:17:47	38,466 mWh	97% of battery	8,956 mW	Drain (critical battery)	0%	HW: -	⋮

DRIPS Histogram

Percent of time spent in DRIPS bucketed by time interval length

Top Offenders

Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
PLMPhase:Microsoft.LockApp_cw5n1h2txyewy! WindowsDefaultLockScreen	PDC Phase	100%	4:17:41
Shell Phase	PDC Phase	0%	0:00:00
No CS Phase	PDC Phase	0%	0:00:00
Connection Phase	PDC Phase	0%	0:00:00
Maintenance Phase	PDC Phase	0%	0:00:00

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data
Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 2

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME		
2	2015-10-30 05:37:56	1:51:01	24,680 mWh	64% of battery	13,347 mW	Drain	0%	HW: -	⋮

DRIPS Histogram
Percent of time spent in DRIPS bucketed by time interval length

Top Offenders
Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
No CS Phase	PDC Phase	100%	1:50:56
Connection Phase	PDC Phase	0%	0:00:00
Shell Phase	PDC Phase	0%	0:00:00
PLM Phase	PDC Phase	0%	0:00:00
Maintenance Phase	PDC Phase	0%	0:00:00

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data
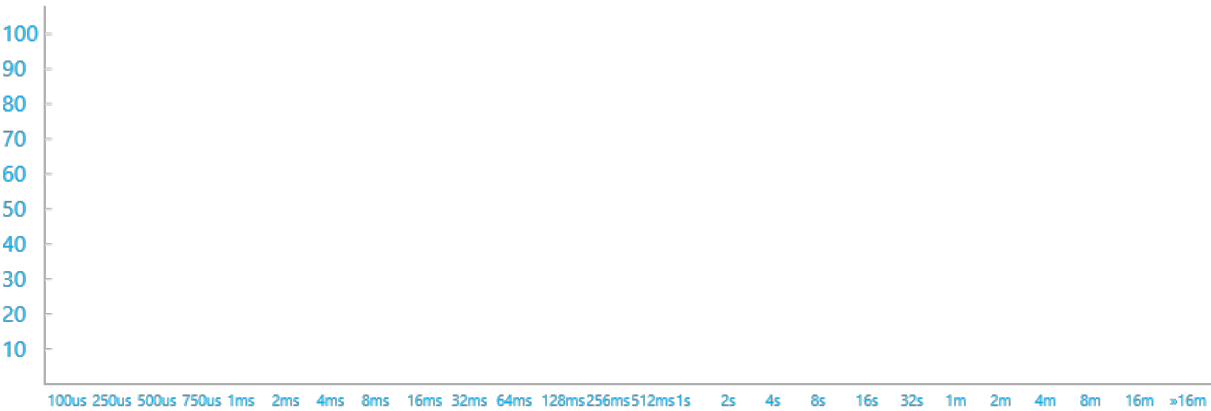Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 3

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME		
3	2015-10-30 10:45:20	0:58:36	13,116 mWh	33% of battery	13,447 mW	Drain (thermal)	0%	HW: -	⋮

DRIPS Histogram
Percent of time spent in DRIPS bucketed by time interval length

Top Offenders
Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	87%	0:50:50
CPU C0 Time	Processor	87%	0:50:50
WNS	Activator	6%	0:03:30
NCSI	Activator	3%	0:01:45
Marvell AVASTAR Wireless-AC Network Controller	Networking	3%	0:01:34

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data
Data obtained from the SRUM database.
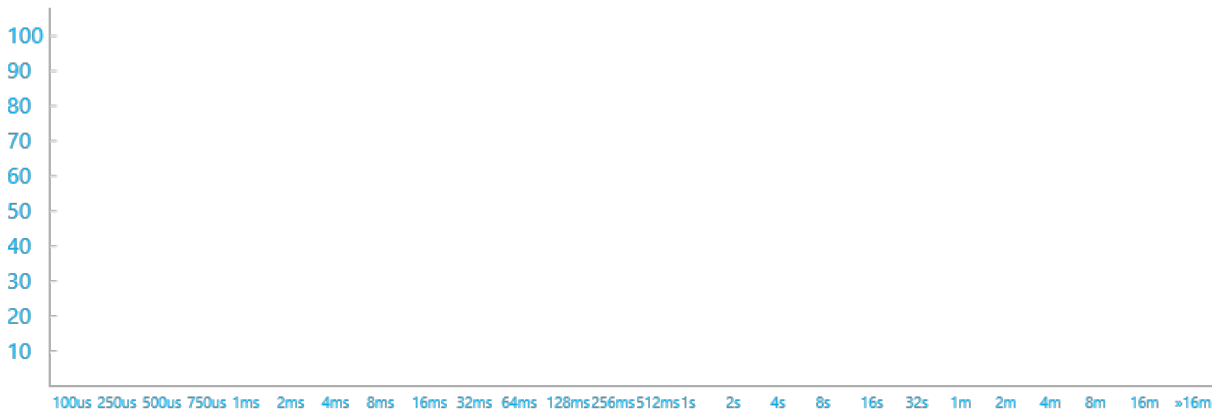
+ Energy Estimation

Connected Standby Session 4

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE	% LOW POWER STATE TIME		
4	2015-10-30 13:19:50	4:36:43	-	-	-	Charge	0%	HW: -	⋮

DRIPS Histogram
Percent of time spent in DRIPS bucketed by time interval length

Top Offenders
Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	93%	4:16:03
CPU C0 Time	Processor	82%	3:45:45
Unknown Client	Activator	4%	0:11:04
Maintenance Phase	PDC Phase	3%	0:07:06
Standard NVM Express Controller (_SB.PCI0.RP05.PXSX)	Fx Device	0%	0:00:15

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data
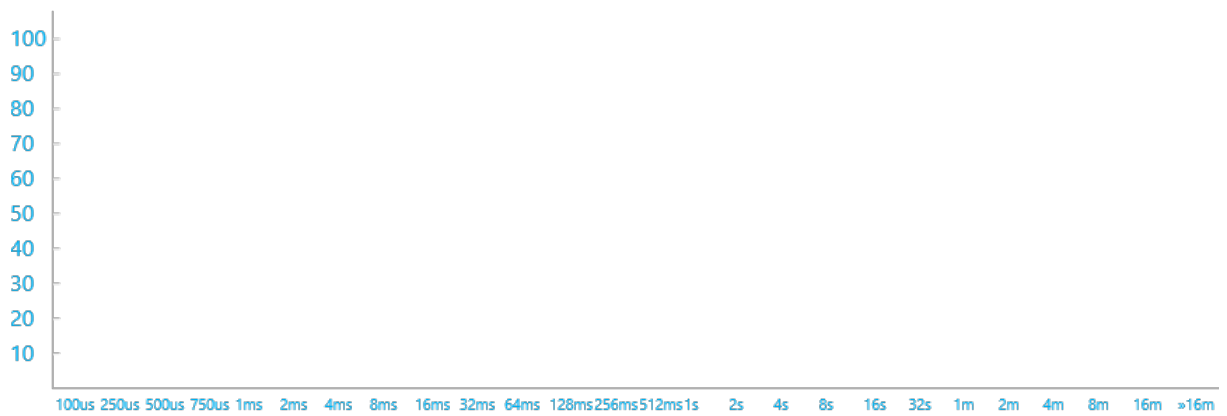Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 5

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE	% LOW POWER STATE TIME		
5	2015-10-30 17:56:50	0:40:30	3,329 mWh	8% of battery	4,941 mW	Drain	0%	HW: -	⋮

DRIPS Histogram
Percent of time spent in DRIPS bucketed by time interval length

Top Offenders
Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
WP WiFi Background Scanning Client	Activator	48%	0:19:26
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	4%	0:01:49
CPU C0 Time	Processor	4%	0:01:42
PLMPhase:Microsoft.LockApp_cw5n1h2txyewy! WindowsDefaultLockScreen	PDC Phase	1%	0:00:27
Universal Telemetry Client	Activator	1%	0:00:24

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data
Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 6

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE	% LOW POWER STATE TIME	
6	2015-10-30 20:03:08	3:15:18	22,596 mWh	57% of battery	6,945 mW	Drain (critical battery)	0% HW: - ⋮

DRIPS Histogram
Percent of time spent in DRIPS bucketed by time interval length

100
90
80
70
60
50
40
30
20
10

100us 250us 500us 750us 1ms 2ms 4ms 8ms 16ms 32ms 64ms 128ms 256ms 512ms 1s 2s 4s 8s 16s 32s 1m 2m 4m 8m 16m »16m

Top Offenders

Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
WP WiFi Background Scanning Client	Activator	65%	2:06:56
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	2%	0:04:05
CPU C0 Time	Processor	2%	0:03:53
WP Location Client	Activator	1%	0:01:57
Marvell AVASTAR Wireless-AC Network Controller	Networking	1%	0:01:10

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data

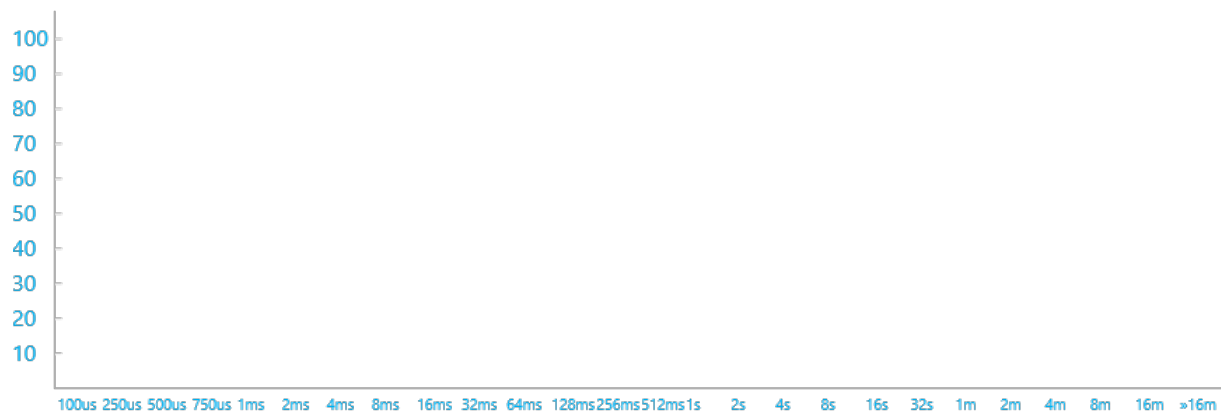Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 7

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME		
7	2015-10-31 08:40:48	0:11:12	1,027 mWh	3% of battery	5,547 mW	Drain	0%	HW: -	⋮

DRIPS Histogram

Percent of time spent in DRIPS bucketed by time interval length

Top Offenders

Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
CPU C0 Time	Processor	6%	0:00:40
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	5%	0:00:34
WLAN.WCM.PDC Phase	Other	3%	0:00:18
Marvell AVASTAR Wireless-AC Network Controller	Networking	2%	0:00:11
No CS Phase	PDC Phase	1%	0:00:09

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

+ Other

Srum Data

Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 8

	START TIME		DURATION	ENERGY	CHANGE	CHANGE RATE		% LOW POWER STATE TIME		
8	2015-10-31	09:00:36	1:51:51	10,244 mWh	26% of battery	5,499 mW	Drain	0%	HW: –	⋮

DRIPS Histogram

Percent of time spent in DRIPS bucketed by time interval length

The vertical axis shows values: 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

The horizontal axis shows: 100us 250us 500us 750us 1ms 2ms 4ms 8ms 16ms 32ms 64ms 128ms 256ms 512ms 1s 2s 4s 8s 16s 32s 1m 2m 4m 8m 16m »16m

Top Offenders

Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	4%	0:04:04
CPU C0 Time	Processor	4%	0:04:01
Marvell AVASTAR Wireless-AC Network Controller	Networking	1%	0:01:12
Marvell AVASTAR Wireless-AC Network Controller (_SB.PCI0.RP09.PXSX)	Fx Device	1%	0:00:57
Standard NVM Express Controller (_SB.PCI0.RP05.PXSX)	Fx Device	0%	0:00:15

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

Srum Data

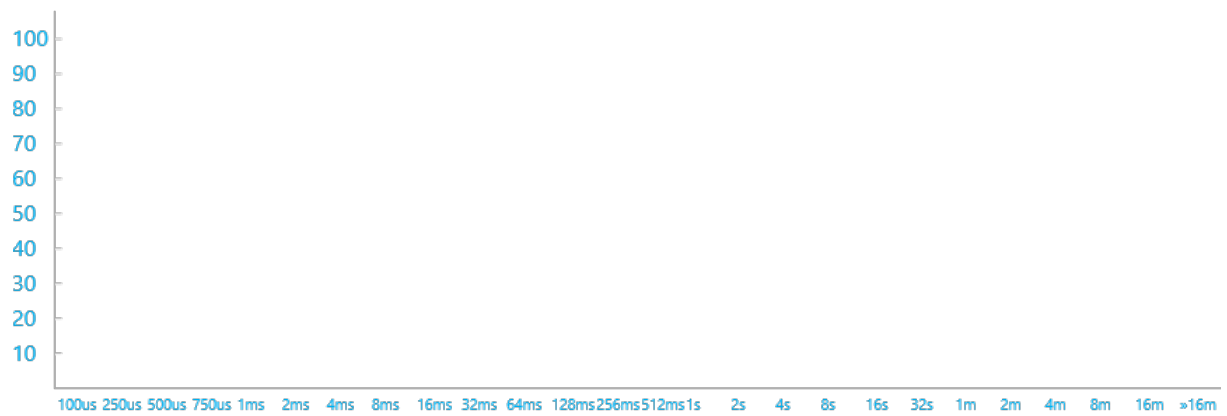Data obtained from the SRUM database.

+ Energy Estimation

Connected Standby Session 9

	START TIME	DURATION	ENERGY CHANGE		CHANGE RATE		% LOW POWER STATE TIME	
9	2015-10-31 12:09:24	0:14:04	1,394 mWh	4% of battery	5,982 mW	Drain	0%	HW: -

DRIPS Histogram

Percent of time spent in DRIPS bucketed by time interval length

Top Offenders
Top 5 offenders, ranked by active time

NAME	TYPE	% ACTIVE TIME	ACTIVE TIME
Intel(R) HD Graphics 520 (_SB.PCI0.GFX0)	Fx Device	6%	0:00:50
CPU C0 Time	Processor	6%	0:00:50
USB xHCI Compliant Host Controller (_SB.PCI0.XHC)	Fx Device	5%	0:00:38
WLAN.WCM.PDC Phase	Other	2%	0:00:14
Low Power Phase	PDC Phase	1%	0:00:05

+ Activators

+ Processors

+ Fx Devices

+ PDC Phases

+ Networking

+ Other

Srum Data
Data obtained from the SRUM database.

+ Energy Estimation

Installed batteries
Information about each currently installed battery

	BATTERY 1
NAME	X910528
MANUFACTURER	DYN
SERIAL NUMBER	45275
CHEMISTRY	LION
DESIGN CAPACITY	38,152 mWh
CAPACITY RATIO	102%
CYCLE COUNT	7