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June Deep Dive Mtg, ITI/Technet Computers Presentation -- Dell Corp

submitted in behalf of ITI and Technet

Additional submitted attachment is included below.

CEC Deep Dive Cost Effectiveness/Technical Barriers

Study creating CEC $2 cost adder

- CEC Desk Top and Notebook Cost analysis dependent on AGGIOS presentation, implementation of which would take 6-10 years
  - One year to study and size potential impact
  - New hardware and software power model specifications 2-3 years if entire industry decides to adopt and support
  - Design new hardware to new spec 12-18 months
  - OS and application redesign to new specs 3-5 years
  - System manufacturers design systems, BIOS, Controller and code based on new silicon and begin testing new OS/applications
  - OS and applications require minimum of 6-12 months testing on new hardware
  - Significant compatibility issues drive 6 months to 2 year delay in shipping
    - Silicon redesign 6-12 months best case
  - OEM's launch on 1-2 platforms and gradually roll out to more once stability is proved
- CEC needs a cost analysis based on real world implementations at time regulation goes into force

Path to $2 cost adder

- PM analysis based upon evaluation of a single 17 in panel consumer desk top replacement notebook
  - Selected because of high energy star idle power ignoring real drivers of the high idle power
- Ability to modify device power through ACPI table population is misunderstanding of PC power management
  - Many PM capabilities will never be exposed to end users due to data integrity and safety reasons
  - ACPI historically required device enumeration while system in S0 preventing removal of power from devices
    - D0 power management which disables and turns off as much as possible while maintaining bus front end has been
    - the norm
    - Recent addition of RD3 (Run Time D3) has enabled non communicative power states in S0 and is being designed into platforms beginning with Ultrabooks
- Risk comes with RD3 that is not acceptable to some customers
  - Manufacturers currently subject notebooks to thousands of Sleep-resume-sleep cycles on multipole units and still find transition failures in customers hands
  - Thousands more transitions of devices run time will come with occasional hangs

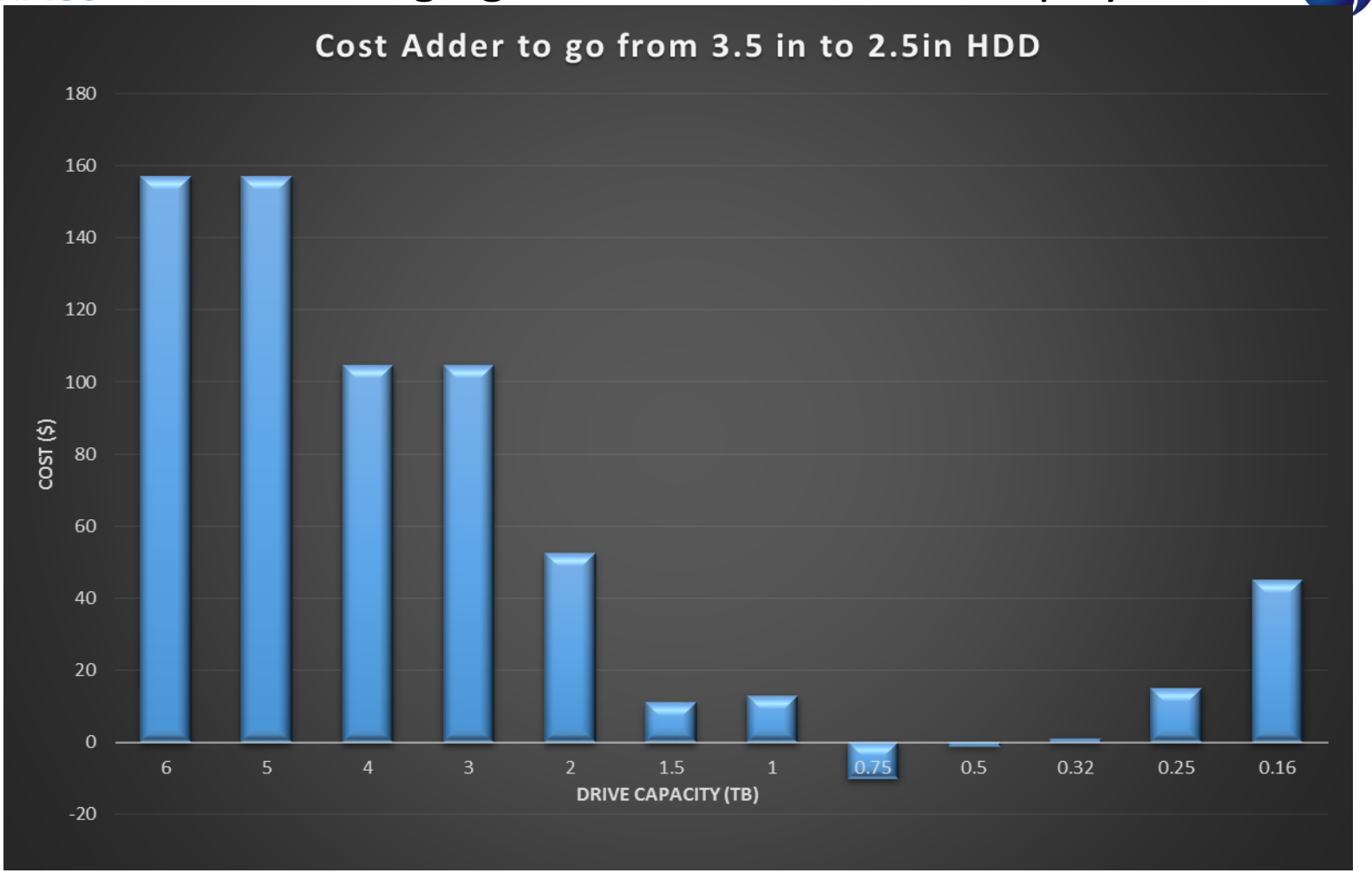
Draft proposal Concerns

- Single DT limit without adders will seriously harm businesses in California
  - Desk top categories exist due to allow for end user required differentiation in computing capabilities.
  - Idle power deltas are inherent and unavoidable across this range of product types and capabilities
  - Valid and critical business needs to exclude some mobile system power management capabilities
    - Zero added risk of system lockup or hang allowed in critical business systems
- Key Business feature additions not considered in IOU studies must be accounted for
  - Security (TPM, hardware encryption engines)
  - Manageability (VPRO …)
  - Discrete Graphics / Processor Accelerators
    - Hybrid graphics capabilities add ~$5 to DT cards in cost and have limited OS support
    - Zero power adder for discrete graphics not reasonable
  - Storage (HDD) capacity and performance
  - I/O capabilities for sensor and control applications

Draft Proposal Cont:

- CEC idle power analysis requires power mode in HDD's that is disallowed by referenced Idle mode test procedure
  - Platters not allowed to spin down in Energy Star test procedure
  - Power levels in CEC models assume platters are stopped
- IOU reduced energy HDD options at no cost adder valid only under limited set of conditions
  - Capacities between about 300GB to 1.5 TB
  - Performance limitations do exist
  - Cost Adders range from $50 to $150 per system outside of this range

Cost of changing to 2.5in HDD in desk top systems



- Cost neutral only applies to limited range of capacities
- 2.5in systems do have lower performance in some applications
- 3.5in Efficient drives still have size and performance tradeoffs
- Customers needing large Capacity will experience between 50 and 150.00 per unit cost increase

HDD Adder Sizing

3.5 in HDD power average by type				
	# Units	DC Pavg	AC @ .8	TEC@ .35
Western Digital Heff	8	4.35	5.44	17
Western Digital Regular	8	5.9	7.38	23
Western Digital Performance	4	8.1	10.13	31
Seagate Heff	3	5.8	7.25	22
Seagate Avg	10	6.53	8.16	25
Seagate Performance	1	8	10.00	31
Heff	11	4.75	5.93	18
Reg	18	6.25	7.81	24
Hperf	5	8.08	10.10	31
2.5 in HDD power average by type				
	# Units	Pavg		TEC@ .30
Western Digital Heff	0			
Western Digital Regular	6	1.53	1.91	5
Western Digital Performance	2	1.7	2.13	6
Seagate Heff				
Seagate Avg	3	1.3	1.63	4
Seagate Performance	1	1.5	1.88	5
Heff				
Reg	9	1.45	1.82	5
Hperf	3	1.63	2.04	5
2.5 in Hybrid HDD power average by type				
	# Units	Pavg		TEC@ .30
Western Digital Heff				
Western Digital Regular				
Western Digital Performance				
Seagate Heff				
Seagate Avg	10	2.17	2.71	7
Seagate Performance				
Heff				
Reg	10	2.17	2.71	7
Hperf				

- CEC and IOU's advocate HDD power when platter is spun down
- Referenced test procedure requires HDD platters to remain spinning
- 24-25 kWh required for avg HDD using just short idle on time
- Systems needing high performance drives would require 31 kWh adder
- 2.5in drives 4-6 kWh from specs
- Hybrid 2.5 in drives – 7kWh from spec

PSU Efficiency vs. Cost

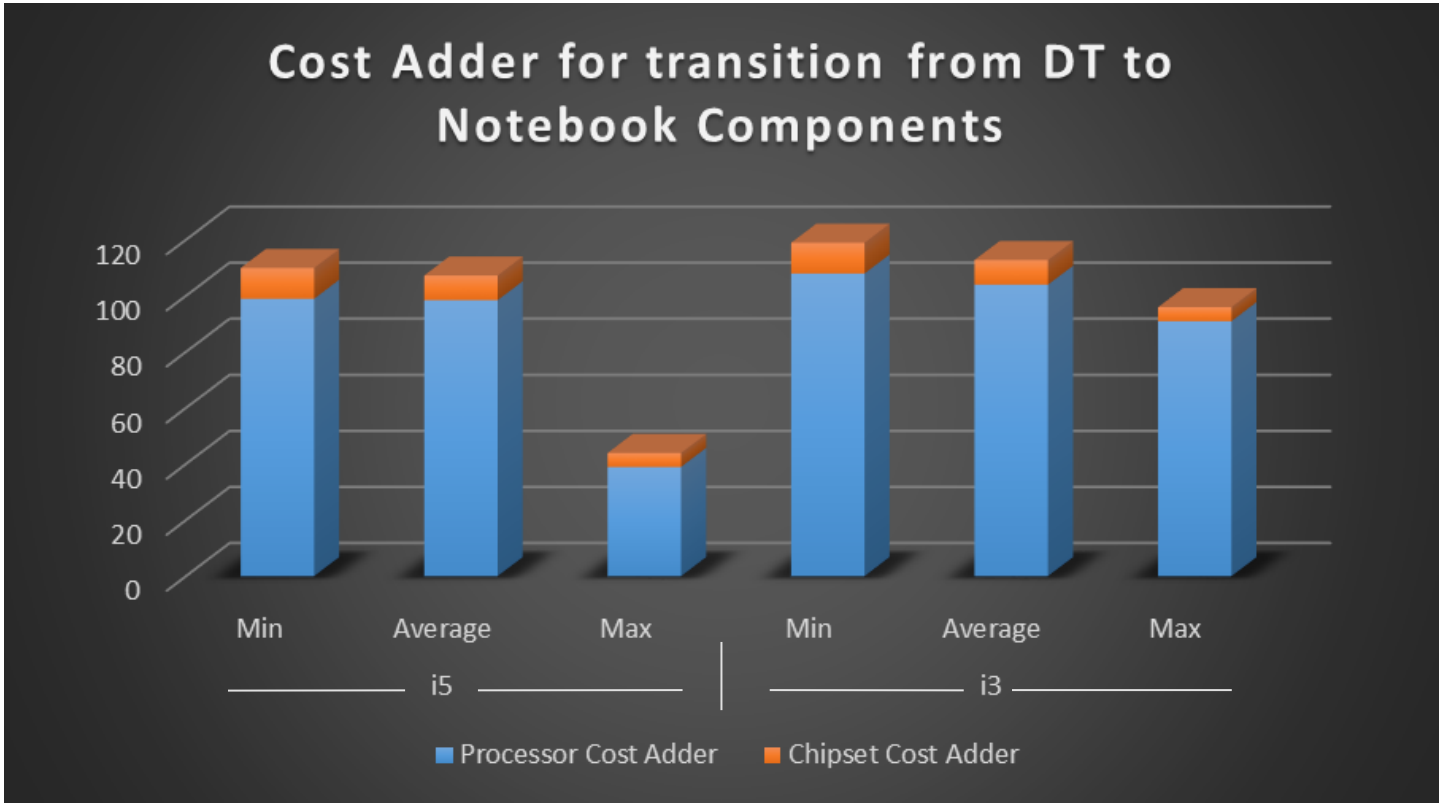
Efficiency Baseline APFC 68% Efficient	300 Watts OEM Cost/ Consumer Cost	460 Watts OEM Cost/ Consumer Cost	270 Watts OEM Cost/ Consumer Cost
80+ Bronze	$2.35/$3.80	$3.65/$5.95	$2.55/$4.15
80+ Silver	$5.00/$8.15	$7.10/$11.55	$4.85/$7.90
80+ Gold	$9.15/14.90	$13.65/$22.20	$8.60/$14.00
80+ Platinum	Not available in multi output format	Not available in multi output format	Not available in multi output format

- ITI aggregated costing information
- IOU part replacement analysis relied on Gold level PSU
- End User Cost should be at least 14.00 just for the PSU changes on systems with APFC PSU's
- $10 cost adder required for systems that have to transition from Bronze to Gold

PSU Sizing

		Desk Top Chassis		Mini Tower Chassis	
PSU Sizing option power allocation	Power ea (W)	Qty.	Element Power	Qty.	Element Power
USB 2.0 connectors	2.50	6	15.0	6	15.0
USB 3.x	4.50	4	18.0	4	18.0
USB-C	15.00				
USB-PD	100.00				
PCI Slots	25.00	0		1	25.0
PCIe slots					
x 4 and x8 slots	25.00	0		1	25.0
half height and x1	10.00	1	10.0	0	
Full height x1	25.00	0		1	25.0
x16 Full Height	75.00	0		1	75.0
x16 Half Height	25.00	1	25.0	0	
Optional pwr connectors 6 pin	75.00				
Optional power connector 8 pin	150.00				
Memory DIMMs	7.00	4	28.0	4	28.0
Processor (TDP) + CPU VR(95%)					
TDP=35	36.84				
TDP-=65	68.42				
TDP=88	92.63	1	92.6	1	92.6
Motherboard (includes Chips Set, Audio, Lan Controller/phy and regulators	8.00	1	8.0	1	8.0
3.5in Drive Bay	10.00	2	20.0	4	40.0
2.5in Drive Bay	5.00	0		1	5.0
Internal 802.11 wireless	4.00	0		0	
Fans	6.00	1	6.0	1	6.0
Power Supply size to provide full functionality			223		363
PSU Size used in Demo Systems			255		290

Processor and Chipset Notebook Component Cost Adder (mainstream Systems)



- Lack of categories or appropriate adders will leave mobile parts as only option to meet limit
  - Between $40 and $120 per unit to change
- Based on i5 / i3 processor and chipset prices currently on Intel.com website
- Minimum price Average Price and Maximum price of available listed processor and chipsets are compared

Feature Penalty of CEC Proposal

	OptiPlex 3020 Micro	OptiPlex 9020 Micro
System feature description from Dell .com Website	**Processor** Intel® Core™ i5-4590T Processor (Quad Core, 6MB, 2.00GHz w/HD4600 Graphics) **Operating System** Windows 7 Professional English/French 64bit (Includes Windows 8.1 Pro license) **Hard Drive** 500GB 2.5inch Serial ATA (7,200 Rpm) Hard Drive **Form Factor** MFF **Form Factor** Micro Form Factor Support for two displays: Despite its small size, the OptiPlex 3020 can support two displays with DisplayPort and VGA connectivity.	**Processor** Intel® Core™ i5-4590T Processor (Quad Core, 6MB, 2.00GHz w/HD4600 Graphics) **Operating System** Windows 7 Professional English/French 64bit (Includes Windows 8.1 Pro license) **Hard Drive** 500GB 2.5inch Serial ATA (7,200 Rpm) Hard Drive **Form Factor** MFF **Form Factor** Micro Form Factor Support for three displays: Despite its small size, the OptiPlex 9020 supports three monitors with DisplayPort and VGA connectivity, including support for an optional additional DisplayPort or HDMI.
USB 3	4	6
USB 2	2	0
Memory	8@1600	16@1600
Out of Band Management	No	VPRO
Hardware Encrypt/Decrypt Accelerator	No	Yes
Processor	I5-4590T	i5-4590T
Off	0.41	0.349
Hibernate	0.41	0.35
Sleep	1.35	1.025
Short Idle	9.21	15.312
Long Idle	8.51	14.212
SysMark07	14.22	16.903
3DMark06	36.25	38.095
TEC	41.6	67.4
CEC Liimit	57.276	63.676
Pass/Fail CEC limits	Pass	Fail
Dell Energy Calculator with PM	42.4	48.8
CEC method annual energy cost adder		$4.13
Power Managed System Annual Cost Adder		$1.02
On 24/7 Annual cost adder		$8.55

- Key security and manageability features cause even Micro chassis system to fail CEC proposed limits
- Corporate security and end user privacy at risk in California as a result of this aggressive limit

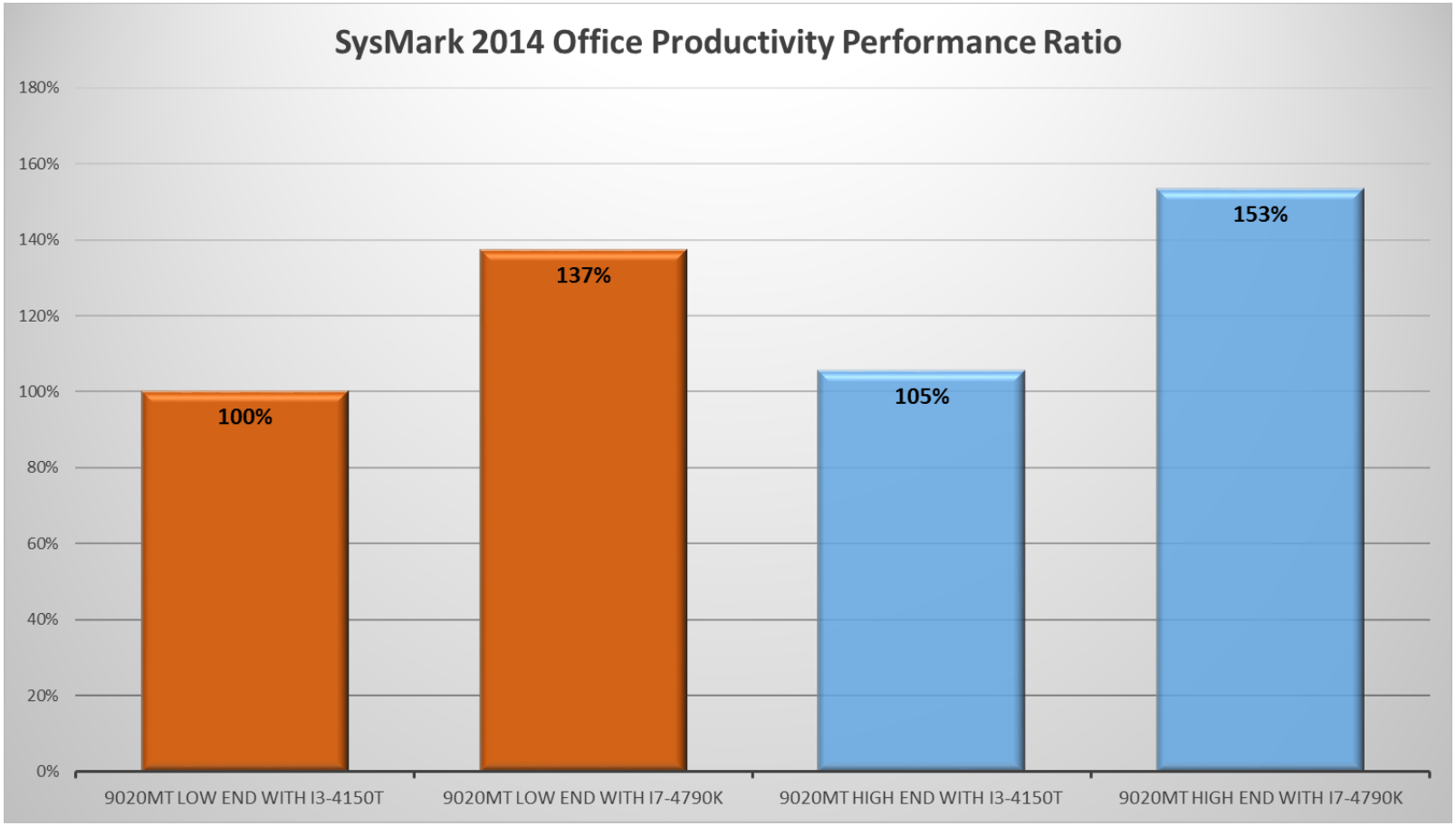
Why Desk Tops in Enterprise?

- Why business customers buy desk tops
  - Use cases where mobility is not valued – call centers, computer labs, desk centric workers
  - Where flexibility/expandability is valued – require multiple storage devices, multiple/large displays or add-in cards
  - Where system performance is highly valued – usages where "Time is Money", example: content creation
  - Where lowest cost, full PC is valued – need Windows/Linux capability
- Usage models of Desk Tops in operation of the businesses
  - Mobile devices are typically used for viewing content, while desktops are used to run a business and are often involved in creating the products themselves.
  - General usages include content creation, managing customer data, designing products.
- Use cases for 24/7 operation of desk top system in enterprise applications.
  - Hospitals
  - Process Control (Chemical, Food, Power, Manufacturing) – Sensors are connected to the PC and the PC controls valves and other devices
  - Video Surveillance
  - Digital Signage (airports, etc)
  - Control/Command Centers – Communications, transportation, etc

Issues with aggressive legal limit

- Limit choice for end users
- Customer required features not accounted for with adders breaks business needs
  - Security and Manageability
  - I/O options for factory interfacing
    - Sensors and control interfaces
- Stagnate technology innovation
  - New interface standards WIFi, 10Gb Ethernet, USB3, etc. often start with relatively high power implementations and get lower over time.
  - Excessively strict power limits will prevent new technology implementations in California

Performance vs Configuration



- i7 vs i3 37% higher on low end config and 45% higher on High End Config
  - Changing processors on lightly configured systems will not show true performance potential as configuration may constrain performance

Idle Power vs Form Factor Demo

Idle Power

- Micro Chassis w/o Security 9W
- Micro with Security 12.5W
- Desk Top 16W
- Mini Tower 23-24W

- No systems with desk top processor and chipset pass 10W idle limit required by CEC proposal
- Adding security and systems management to a mobile system (Level VI EPS, mobile processor and chipset, SSD and no optical drive) causes it to fail desk top limits.

TechNet

ITI

THANK YOU