ENERGY STAR V6
ITI -New Client Category Proposal

EPA/ITI Meeting

1/23/2012

Agenda

- Overview/Problem Statement
- Key Elements of Methodology
- Data Analysis
- Summary/Conclusions

Today's Objective: Methodology discussion only. TEC targets and adders discussion to follow later

Why a New Category Proposal

Issues & Learning

- Entry Errors in dataset (testers are entering wrong data)
  - Graphics Classes
  - Attributes are too complex to understand by tester (Example -Memory Channels)
- Need to separate the lower capability systems from higher capability systems (categories)
  - Current category system based on cores/memory channels as proxy for high-end/low-end is not always workable
- Learning from Energy Star V5: Fix dGfx definition issue (Done), and coverage to ensure broad dGfx representation for V6
  - Today V5 systems are approaching 25%
  - Issue replicated globally (ErP, Japan, …)
- Ecma has defined new discrete Graphics Classes and system categories
  - dGfx based on frame buffer bandwidth (as proxy for GPU performance)

Proposed Resolution

- Automate category enumeration (SW program)
  - Attributes are available in current ENERGY STAR dataset
  - Can write a program to access attributes automatically for future testers
- New Category based on a CPU Perf proposal to separate lower capability systems from higher capability systems

  CPU Perf = [# of CPU cores]*[CPU base freq.]
    - Possibility for easy automation (Both attributes in current ENERGY STAR dataset)
  - Like graphics classes, perf category is a range of Perf values
- Separate iGfx and dGfx categories to allow appropriate dGfx system representation
  - Not competing with lower energy iGfx systems
- No Changes to dGfx classes; Ecma process allows system category changes through the Ecma 383 category registry
  - Similar to graphics class change control

Key Elements of Methodology

Categorization Goal: Establish system categories based on like products with similar capability, within each category.

Today's System Category

- Category separation based on product attributes
  - Memory Channels, number of CPU cores, Memory Size, etc. are used
  - Analysis shows this no longer works
- Graphics Class separation based on discrete graphics capability (Ecma-383)
  - Bandwidth ranges as a proxy for performance
- Other capabilities that distinguish power
  - Display size and technology (new for V6)
- Additional allowances for other capabilities
  - Hard drives; Audio, networking, TV Tuner (new for V6)

Proposed System Category Changes

- Product Capability (category) based on new CPU Performance Class proposal
  - Ranges of performance based on [# CPU Cores]*[Base CPU Freq]
  - Not a criteria for pass fail, but a system for categorizing products
- Consistent category approach across Notebooks, AIO and Desktop computers
  - Cat0: Lower capability systems(iGfx and dGfx systems)
  - Cat1-Cat2: All mainstream and high-end integrated graphics based systems
  - Cat3-Cat4: All mainstream and high-end discrete graphics based systems

No Change to System Categorization Goal

Graphics Classes

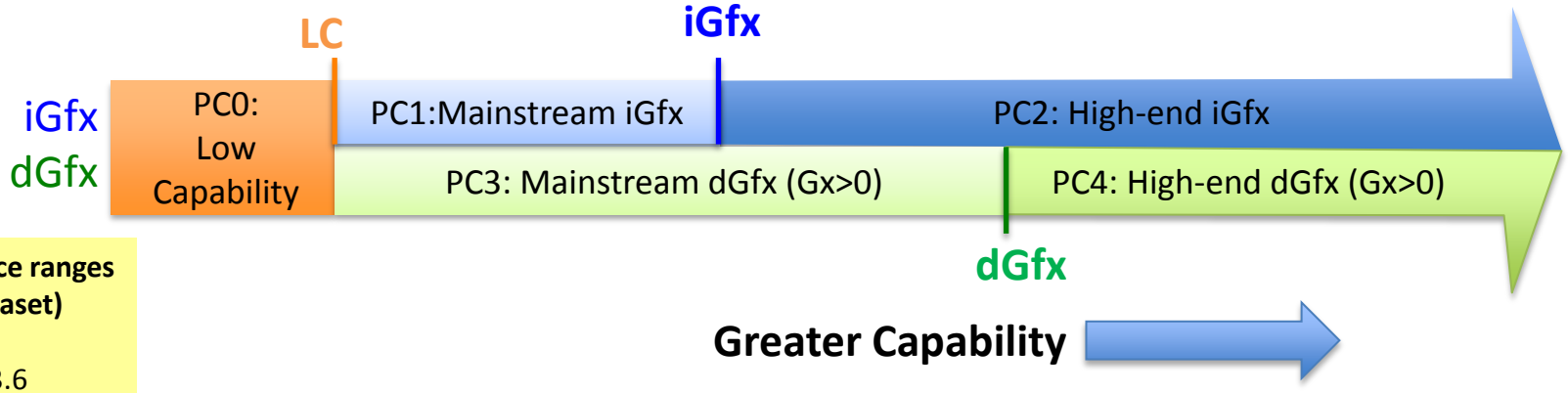
Existing Ecma-383 Proposal

- No Changes

Graphics Class	Bandwidth
G0	Integrated Graphics
G1	FB_BW ≤ 16
G2	16< FB_BW ≤ 32
G3	32 <FB_BW ≤ 64
G4	64 <FB_BW ≤ 96
G5	96 <FB_BW ≤ 128
G6	FB_BW > 128 (< 192-bit)
G7	FB_BW > 128 (≥ 192-bit)

New System Categories Concept (based on Performance Classes)

- Similar to dGfx approach, each system category gets its own Performance Class (range of performance within each system category)
  - NB, AIO or DT



Performance ranges (ITI dataset)
NB: 1 – 10
DT: 1.6 – 33.6
AIO: 3.2 – 13.6

Performance Class	Performance Range	System Description
PC0	P < LC	LC=Low Capability
PC1	LC <= P < iGfx	Main stream iGfx
PC2	P > iGfx	High-end iGfx
PC3	LC <= P < dGfx	Main stream dGfx
PC4	P > dGfx	High-end dGfx

V6 Category Proposal (Details)

Current Ecma Categories

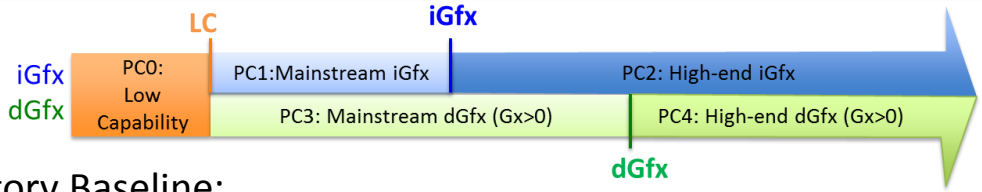
V6 Original Categories

Notebook	NB0	NB1	NB2	NB3	NB4
Market	netbook	lowend	mainstream	performance	high-end
cores	N/A	cores ≤ 2	cores = 2	cores ≥ 3	cores ≥ 3
Mem Channels	ch mem = 1	ch mem = 2	ch mem ≥ 2	ch mem ≥ 2	ch mem ≥ 2
Screen Size	screen size ≤ 12.1"	Screen size ≤ 13.3"	Any screen size	Any Screen size	Any screen size
Base Memory (GB)	1	2	2	2	4
Base Gfx	igfx	igfx	igfx	igfx	G3
Gfx Adders	dGfx ≤ G7	dGfx ≤ G7	dGfx ≤ G7	dGfx ≤ G7	G3 < dGfx ≤ G7

Desktop/AIO	DT0	DT1	DT2	DT3	DT4
Market	Entry	Mainstream	Performance	Highend	Very high end/enthusiast
cores	N/A	cores ≤ 2	cores ≥ 3	cores ≥ 4	cores ≥ 5
Mem Channels	ch mem = 1	ch mem = 2	ch mem ≥ 2	ch mem ≥ 2	ch mem ≥ 2
Base Memory (GB)	1	2	2	4	4
Base Gfx	igfx	igfx	igfx	dGfx ≥ G5	dGfx ≥ G5
Gfx Adders	dGfx ≤ G7	dGfx ≤ G7	dGfx ≤ G7	dGfx ≥ G6	dGfx ≥ G6
PCIe					PCIe ≥ 2

New Energy Star V6 Client Category proposal (CPU Perf based)

Description	CAT 0	CAT 1	CAT 2	CAT 3	CAT 4
NB Performance (p)	p<NBLC	NBLC<=p<NBiGfx	p>=NBiGfx	NBLC<=p<NBdGfx	p>=NBdGfx
DT Performance (p)	p<DTLC	DTLC<=p<DTiGfx	p>=DTiGfx	DTLC<=p<DTdGfx	p>=DTdGfx
AIO Performance (p)	p<AIOLC	AIOLC<=p<AIOiGfx	p>=AIOiGfx	AIOLC<=p<AIOdGfx	p>=AIOdGfx
Graphics Class	Any	G0	G0	Gx>0	Gx>0
Graphics Baseline	G0	G0	G0	G1	G1
Memory Baseline	1GB	1GB	1GB	1GB	1GB
Note: p =[# of CPU cores]*[CPU base freq.]					



Example

Notebook Range		
NBLC	NBigfx	NBdgfx
2	5.2	9

Desktop Range		
DTLC	DTigfx	DTdgfx
3	7	9

AIO Range		
AIOLC	AIOigfx	AIOdgfx
4	6.6	10

- Perf Category Baseline:
  - iGfx baseline TEC: 1 GB Memory, No TV Tuner, No discrete Audio, 1 HDD,
  - dGfx baseline TEC: iGfx baseline + G1 class adder
  - Additional adders adjusted to above baseline
- Performance Range: Separate tunable ranges for DT, NB, AIO

Setting Performance Range

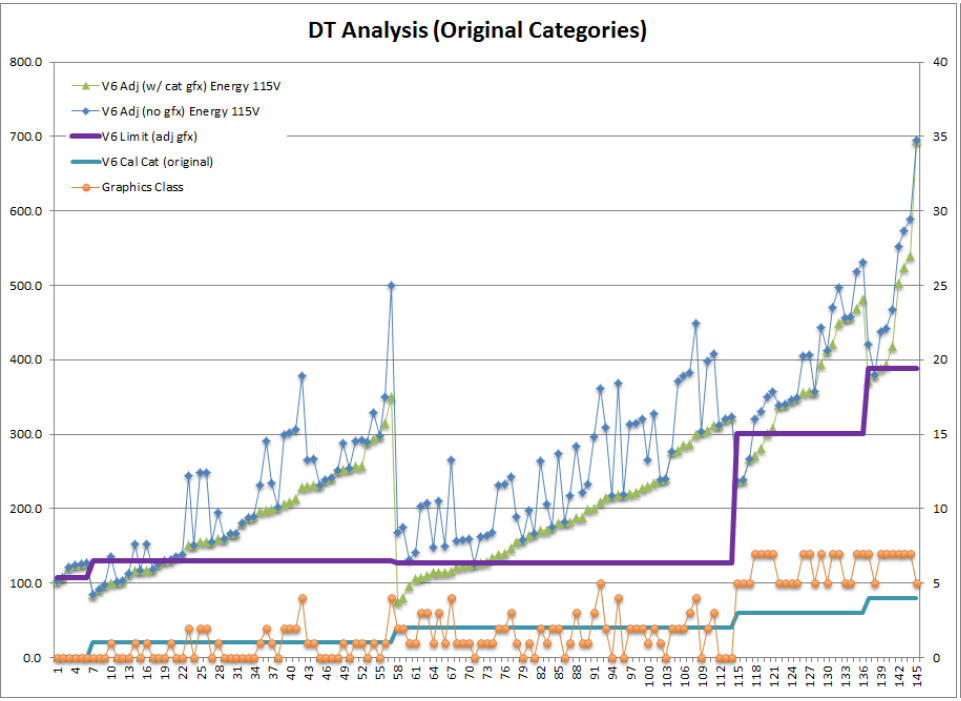
- Low-Capability(LC)
  - Set range such that low capability systems are grouped together
- Main-stream Vs. High-end
  - Set range to get even a distribution between main-stream and high-end systems (in separate iGfx and dGfx categories)

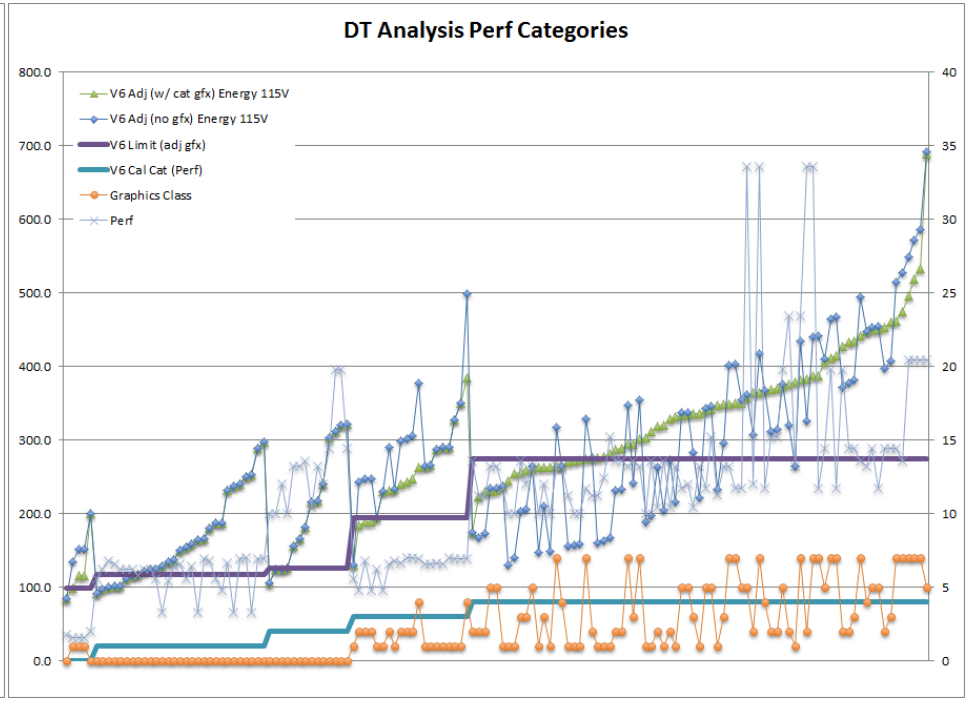
Data Analysis

- Example DT charts (original vs. new)
  - Focus on well-behaved TEC trending
  - Distribution of system in each category
- Pass/fail distribution table (original vs. new)

Note: Today's focus is on methodology only. TEC targets and adders discussion to follow later

Performance Categories/Desktops





- Original Categories
  - Same TEC Limits for DT1 and DT2
  - Similar TEC dynamic ranges between DT1 and DT2
  - Very few systems in DT0 and DT4

- Performance Categories
  - Good separation of TEC limits
  - Even distribution of systems across categories
  - Increasing TEC dynamic range – from low to high energy categories

System Distribution (Original vs. New)

Original category-system distribution

Original Categories			
Cat	# NB Sys	# DT Sys	# AIO Sys
0	1	6	8
1	1	51	17
2	20	57	14
3	8	22	0
4	4	9	0

Notebook Range		
NBLC	NBigfx	NBdgfx
2	5.2	9

Desktop Range		
DTLC	DTigfx	DTdgfx
3	7	9

AIO Range		
AIOLC	AIOigfx	AIOdgfx
4	6.6	10

New category – system distribution

Perf Categories			
Cat	# NB Sys	# DT Sys	# AIO Sys
0	2	5	6
1	8	29	10
2	3	14	9
3	10	20	9
4	11	77	5

- Performance Class allows finer tuning of the system distribution through performance range

Pass/Fail distribution (Original vs. New)

Original Category

	DT Category (Pass Count)						
Gx	Total Pass	DT0	DT1	DT2	DT3	DT4	Total
0	14	2	10	1	25	0	45
1	11	0	3	8	0	0	32
2	2	0	0	2	0	0	23
3	3	0	0	3	0	0	8
4	2	0	0	1	4	0	5
5	3	0	0	0	3	1	14
6	0	0	0	0	0	0	0
7	4	0	0	0	3	2	18
	39						145

Performance Category

	DT Category (pass count)						
Gx	Total	DT0	DT1	DT2	DT3	DT4	Total
G0	13	1	8	4	0	0	45
G1	11	1	0	0	2	8	32
G2	6	0	0	0	3	3	23
G3	3	0	0	0	0	3	8
G4	1	0	0	0	0	1	5
G5	3	0	0	0	0	3	14
G6	0	0	0	0	0	0	0
G7	2	0	0	0	0	2	18
	39						145

- Graphics class distribution across system Categories
  - Shows good distribution of graphic classes across system categories
  - Graphics adders appear about right

Current Issues

- Limited ITI dataset
  - Not enough Notebook and AIO systems

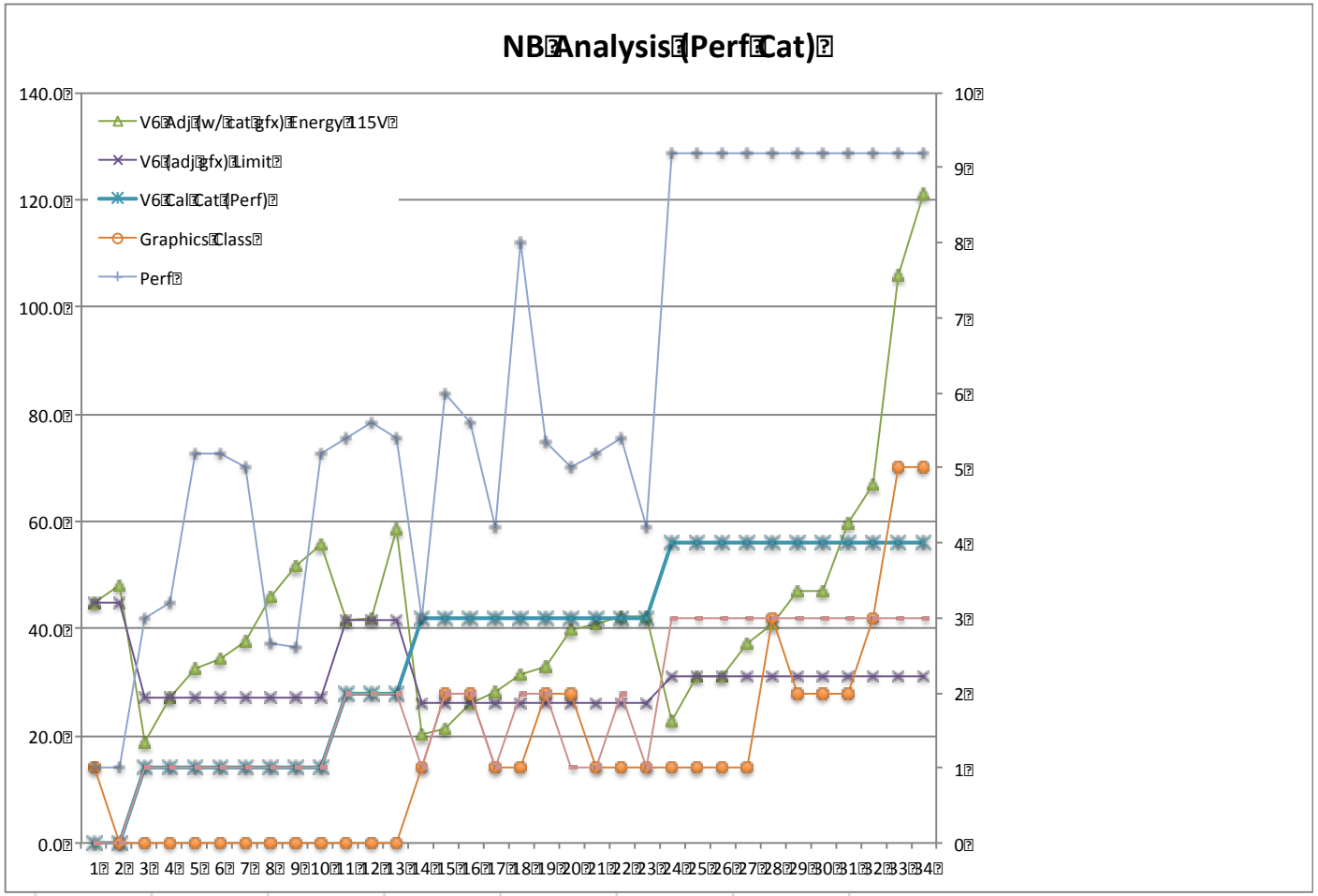
- Recommendations
  - Apply full EPA's V6 data set to new methodology
  - Pilot to validate methodology, and get kinks out
  - Report back in 1-2 weeks
  - Final decision after pilot

Summary/ Conclusions

- Current Ecma-383 system category approach has challenges; need a fix similar to dGfx fixes
- ITI is proposing system categorization based on CPU performance, and separating lower capability, and iGfx from dGfx categories.
- Early results are encouraging.
- Will require full EPA V6 dataset to validate methodology and get agreement.

Back-up

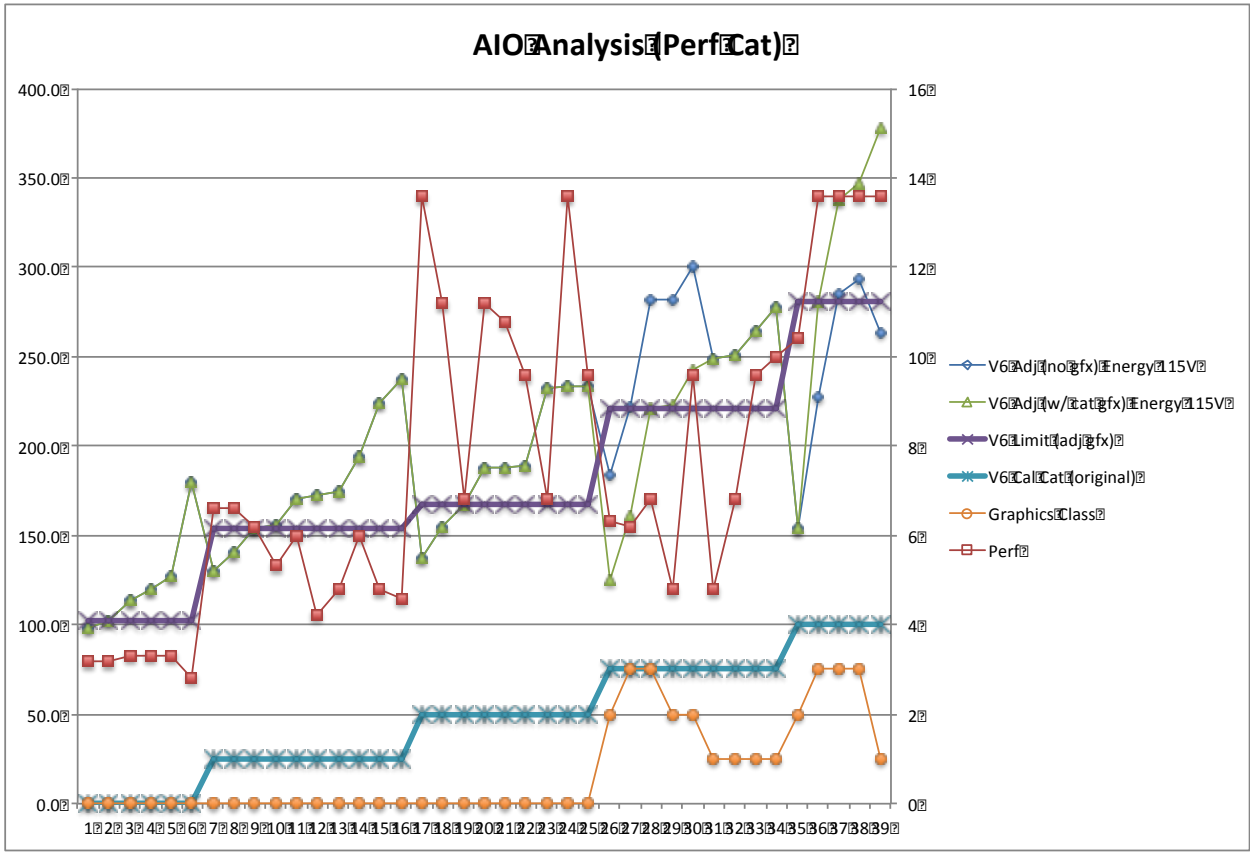
Performance Categories/Notebook



	NB Category (pass count)						
Gx	Total	NB0	NB1	NB2	NB3	NB4	Total
0	3	0	2	1	0	0	12
1	5	1	0	0	1	3	11
2	2	0	0	0	2	0	7
3	0	0	0	0	0	0	2
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	2
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0

- No G3 or G5 cards passing
  - Limits might be to low

Performance Categories/AIOs



	AIO Category (count)						
Gx	Total	AIO0	AIO1	AIO2	AIO3	AIO4	Total
0	8	2	3	3	0	0	25
1	0	0	0	0	0	0	5
2	2	0	0	0	1	1	4
3	3	0	0	0	2	1	5
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0

- Systems with most graphics cards are passing!
- G1 cards not passing!
  - But many pass in DTs