INTEL APPLICATION PERFORMANCE SNAPSHOT (APS)

Klaus-Dieter Oertel
Intel CVCG Developer Products Division

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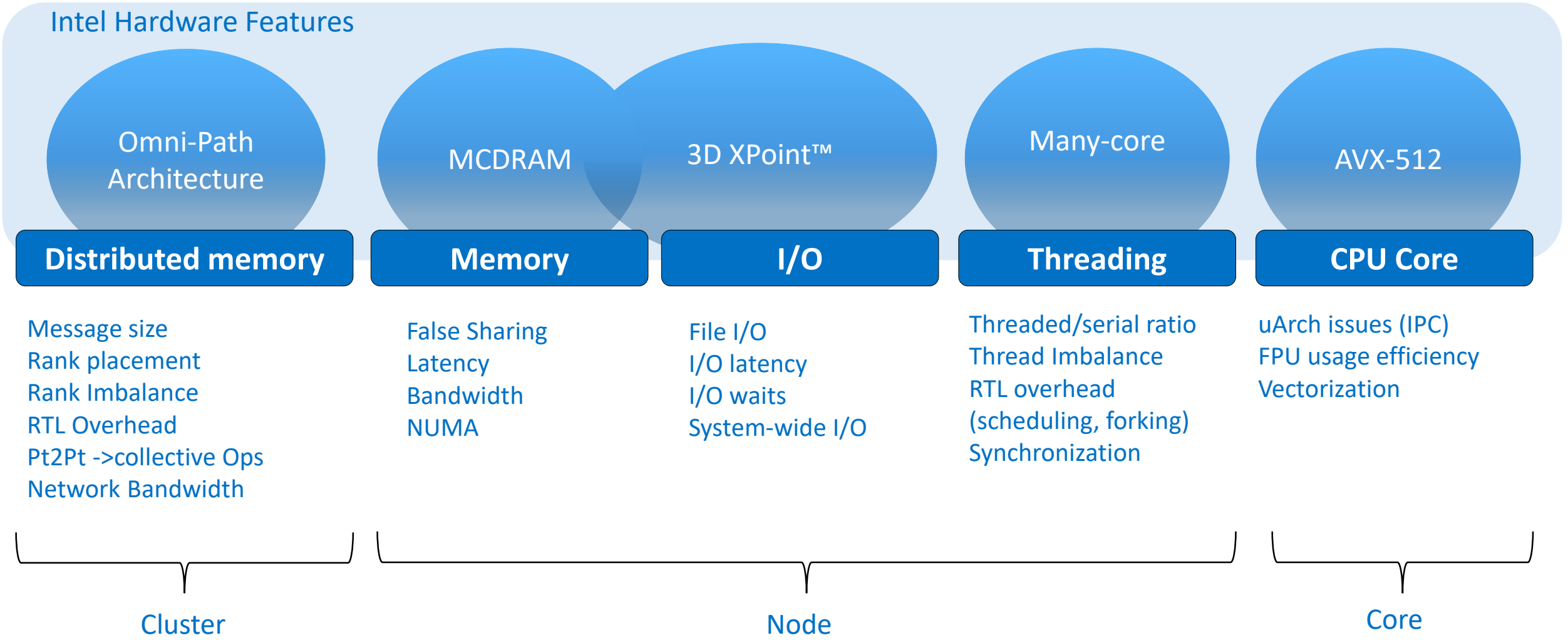
ASPECTS OF HPC/THROUGHPUT APPLICATION PERFORMANCE



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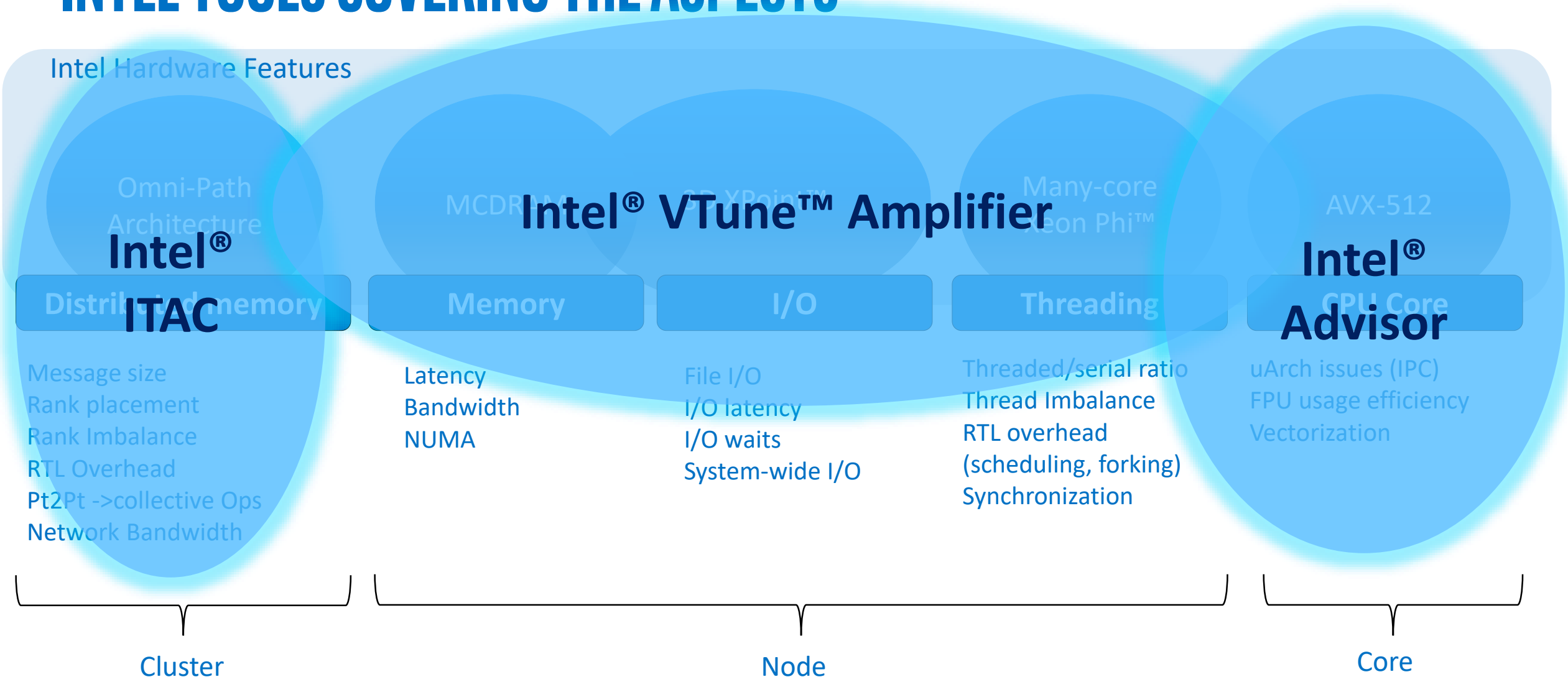
INTEL TOOLS COVERING THE ASPECTS



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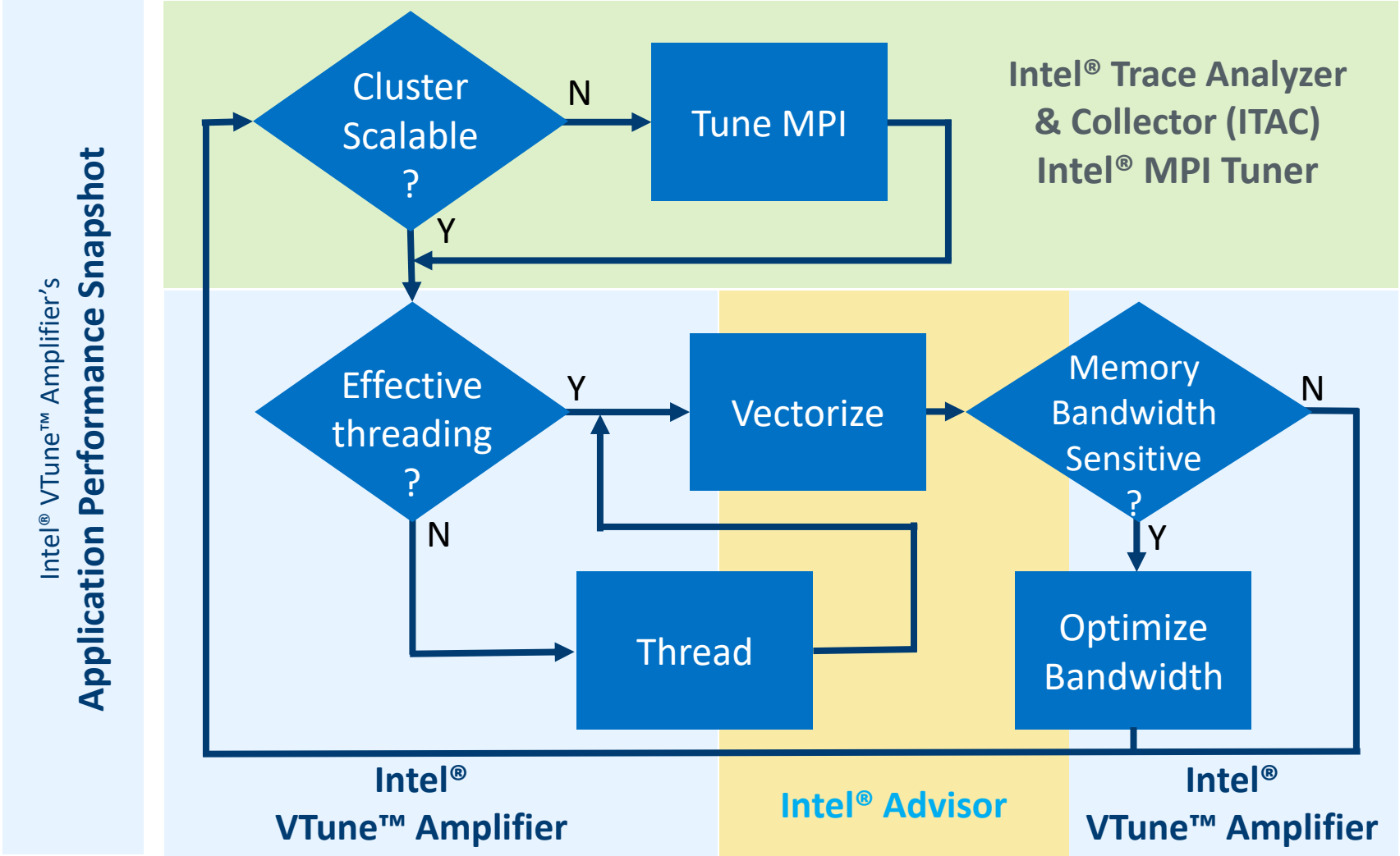
Performance Analysis Tools for Diagnosis
Intel® Parallel Studio



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BEFORE DIVE TO A PARTICULAR TOOL..

- How to assess easily any potential in performance tuning?
- What to use on big scale not be overwhelmed with huge trace size, post processing time and collection overhead?
  - On a KNL cluster customers can end-up with more than 1000 ranks on just 8 nodes
- How to quickly evaluate environment settings or incremental code changes?
- Which tool should I use first?
- Answer: try Application Performance Snapshot 2018

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APPLICATION PERFORMANCE SNAPSHOT (APS)

- High-level **overview** of application performance
- Primary optimization areas and **next steps** in analysis with deep tools
- **Easy** to install, run, explore results with CL or HTML reports
- **Low** collection overhead
- **Scales** to large jobs
- Multiple methods to obtain
  - Part of Intel® Parallel Studio XE, VTune Amplifier standalone
  - Separate **free** download (110Mb) from APS web page
    - https://software.intel.com/sites/products/snapshots/application-snapshot/

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APS USAGE

Setup Environment

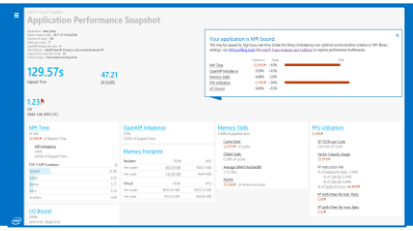
- >source <APS_Install_dir>/apsvars.sh

Run Application

- >aps <application and args>
- MPI: >mpirun <mpi options> aps <application and args>

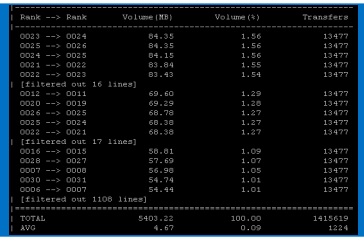
Generate Report on Result Folder

- >aps –report <result folder>



Generate CL reports with detailed MPI statistics on Result Folder

- aps-report –<option> <result folder>



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Application Performance Snapshot Adds MPI

Data in One Place: MPI+OpenMP+Memory Floating Point—Intel® VTune™ Amplifier

Quick & Easy Performance Overview

- Does the app need performance tuning?

MPI & non-MPI Apps†

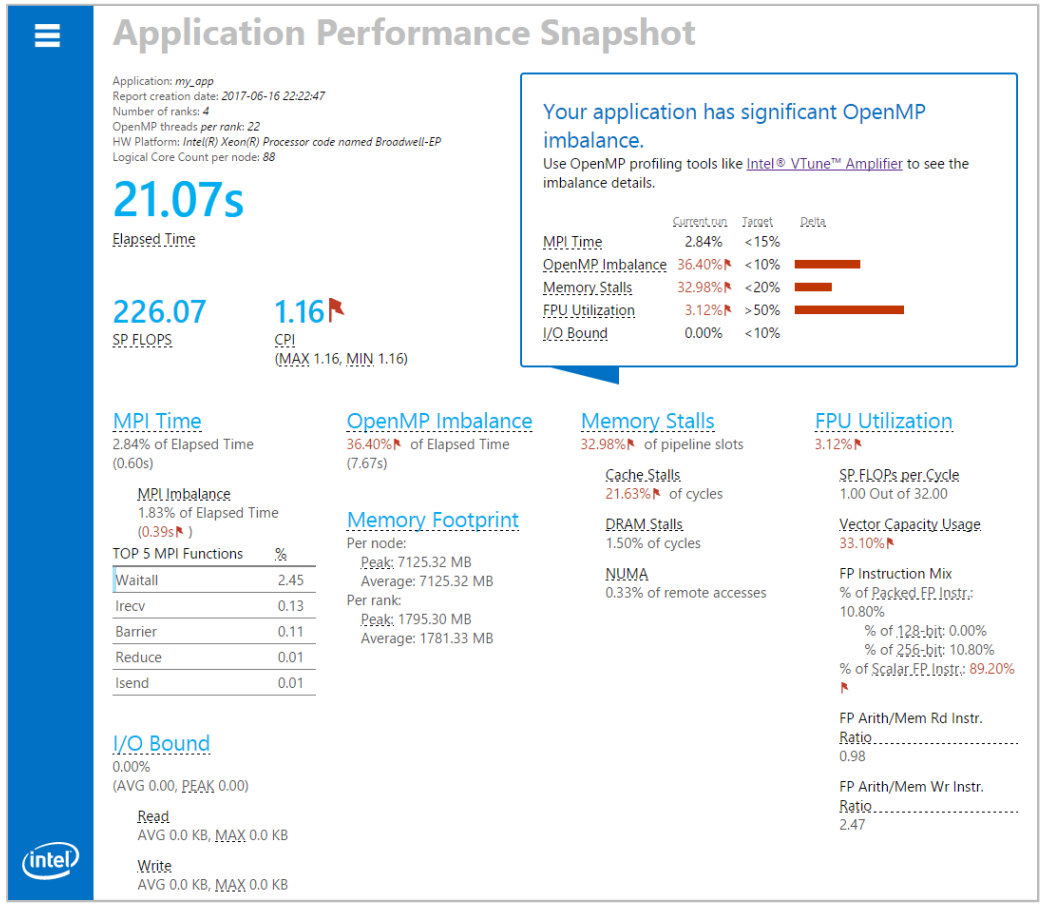
- Distributed MPI with or without threading
- Shared memory applications

Popular MPI Implementations Supported

- Intel® MPI Library
- MPICH & Cray MPI

Richer Metrics on Computation Efficiency

- CPU (processor stalls, memory access)
- FPU (vectorization metrics)



†MPI supported only on Linux*

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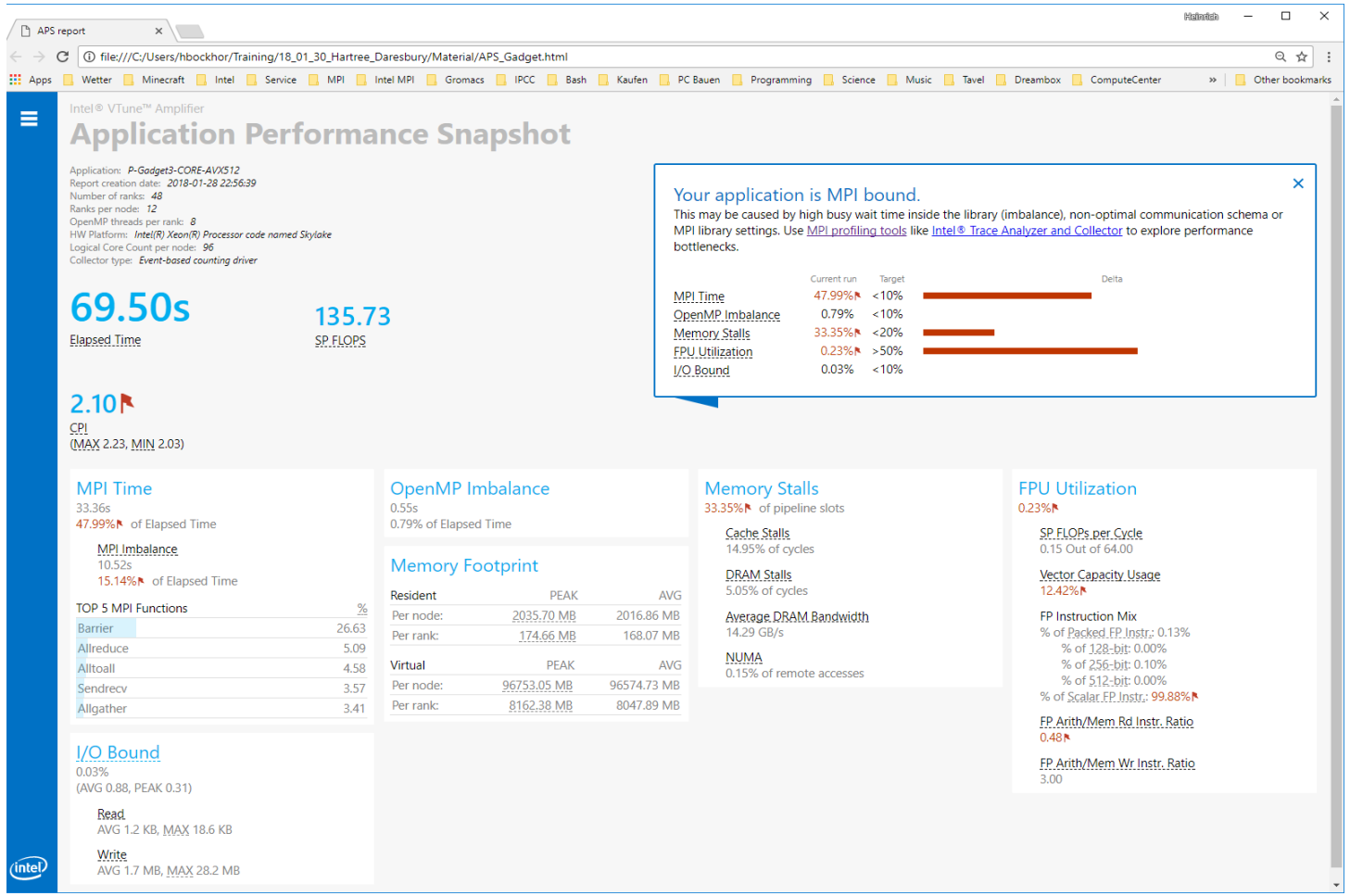
APS Snapshot for Gadget3



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APS COMMAND LINE REPORTS - ADVANCED MPI STATISTICS (1/3)

- MPI Time per rank
  - aps-report –t <result>

MPI Time per Rank

Rank	LifeTime(sec)	MPI Time(sec)	MPI Time(%)	Imbalance(sec)	Imbalance(%)
0007	72.52	14.31	19.74	4.84	6.67
0004	72.53	11.57	15.96	3.26	4.50
0005	72.52	11.40	15.72	3.20	4.42
0006	72.51	11.11	15.32	3.17	4.37
0000	72.49	11.08	15.29	4.33	5.97
0001	72.52	10.95	15.10	3.01	4.15
0002	72.49	10.79	14.88	2.57	3.55
0003	72.50	10.64	14.68	2.50	3.45
TOTAL	580.07	91.86	15.84	26.88	4.63
AVG	72.51	11.48	15.84	3.36	4.63

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APS COMMAND LINE REPORTS – ADVANCED MPI STATISTICS (2/3)

- Message Size Summary by all ranks
  - aps-report –m <result>

Message Sizes summary for all ranks

Message size(B)	Volume(MB)	Volume(%)	Transfers	Time(sec)	Time(%)
8	1.49	0.09	195206	27.79	37.93
176	0.41	0.02	2420	27.67	37.78
4	0.00	0.00	1150	15.55	21.22
100264	115.89	6.94	1212	0.27	0.37
98400	113.74	6.81	1212	0.19	0.26
66256	38.29	2.29	606	0.17	0.23
[filtered out 57 lines]					
TOTAL	1670.60	100.00	265160	73.25	100.00

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APS COMMAND LINE REPORTS - ADVANCED MPI STATISTICS (3/3)

- Data Transfers for Rank-to-Rank Communication
  - aps-report –x <result>

And many others – check
  - aps-report -help

Rank --> Rank	Volume(MB)	Volume(%)	Transfers
0023 --> 0024	84.35	1.56	13477
0025 --> 0026	84.35	1.56	13477
0024 --> 0025	84.15	1.56	13477
0021 --> 0022	83.84	1.55	13477
0022 --> 0023	83.43	1.54	13477
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0012 --> 0011	69.60	1.29	13477
0020 --> 0019	69.29	1.28	13477
0026 --> 0025	68.78	1.27	13477
0025 --> 0024	68.38	1.27	13477
0022 --> 0021	68.38	1.27	13477
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0016 --> 0015	58.81	1.09	13477
0028 --> 0027	57.69	1.07	13477
0007 --> 0008	56.98	1.05	13477
0030 --> 0031	54.74	1.01	13477
0006 --> 0007	54.44	1.01	13477
[filtered out 1108 lines]			
TOTAL	5403.22	100.00	1415619
AVG	4.67	0.09	1224

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COLLECTION CONTROL API

Since 2018 Update 2

- To measure a particular application phase or exclude initialization/finalization phases use:

  MPI:

  - Pause: MPI_Pcontrol(0)
  - Resume: MPI_Pcontrol(1)

  MPI or Shared memory applications:

  - Pause: __itt_pause()
  - Resume: __itt_resume()
    - See how to configure the build of your application to use itt API

  Tip: use aps “-start-paused” option allows to start application without profiling and skip initialization phase

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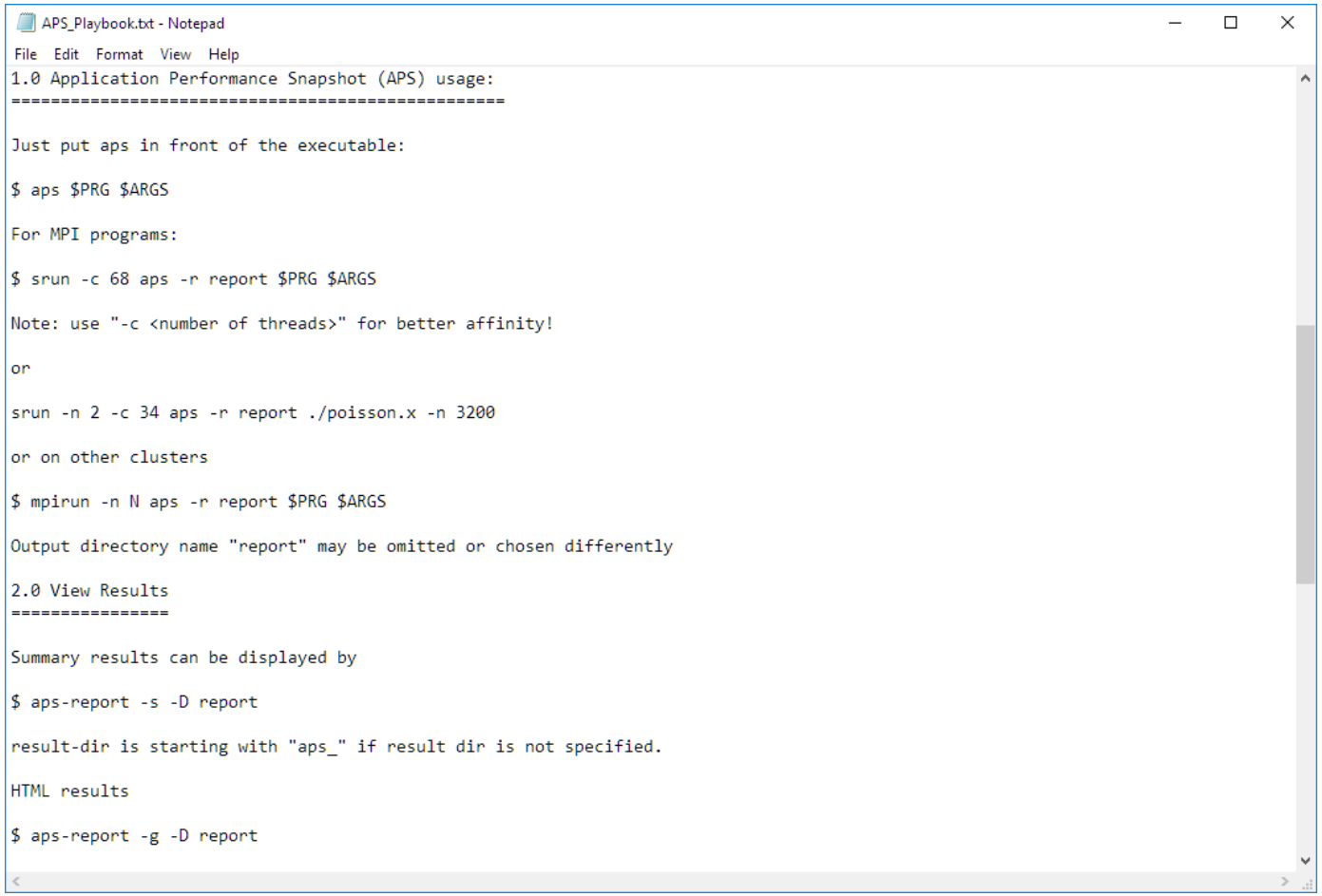
PLAYBOOK FOR APS

- ASCII file containing instructions for tools usage (APS_Playbook.txt)



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SUMMARY

Intel® VTune™ Amplifier's Application Performance Snapshot is:

- Your entry point for HPC application performance analysis
- A part of Parallel Studio XE or easy to install and free standalone package
- Simple and well-structured command line and HTML reports
- Clear next steps for tuning with connection to detailed performance tools
- Tool-of-choice of MPI efficiency analysis at scale

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