SWCMG
APRIL 20, 2020

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SAVE MSU'S AND REDUCE RUN-TIMES FOR ANALYTICS & MXG REPORTING

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AGENDA

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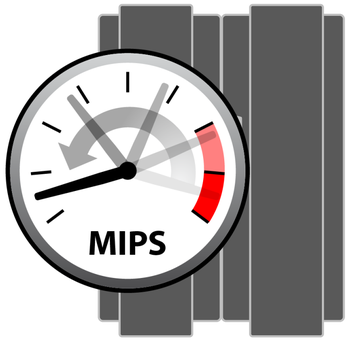
- Business Goals
- Why Explore this Solution?
- Discovery Process
- Review of Business Findings
- Solution Results
- Next Steps to More Savings!

PROJECT GOALS

- Reduce 4 Hr. Rolling Average
- Reduce mainframe licensing costs
- Reduce ongoing code maintenance
- Modernize Analytics: Introduce new programming tools such as R and Python
- Inventory and optimize MXG PDB builds and reporting
- Quicker Analytics: Get Answers Faster
- Add in Additional DB2 records for Analysis

WHY CONSIDER OFF-HOST SAS PROCESSING?

- Remove data center processing that is not revenue generating, such as MXG, off the mainframe
  - SAS language processing is often ranked in the top “heavy hitters” list of programs
- Prepare for Tailored Fit Pricing
  - Reduce the baseline
  - Manage growth over time
- Opportunity to:
  - Reduce Analytics Run Time
  - Modernize SAS processes, integrate with R and Python
  - Streamline existing SAS processing for efficiency
  - Fulfill latent demand for additional/more timely SAS analytics & workloads



python™

R

THE PROCESS

DISCOVERY	Identification of SAS estate and associated assets
ANALYSIS	Analysis, interpretation, presentation of results with recommendations for change
OPTIMIZATION	Improve operations efficiencies and areas to modernize applications
MIGRATION	Migration of SAS language-based workloads to distributed systems SAS server
DEVELOPMENT	Uncover alternate solutions using existing technologies

SMF ANALYSIS SUMMARY

- Reporting Period: May–June
- 6 LPARs

- **SAS**
  - #2 on the Heavy Hitter's list
  - 28,000+ SAS executions
    - 399 unique job names

Future MSU Reduction Targets

- **FTP Activity**
  - 631,000 file transfers via FTP over Port 21
  - 233,000 Client FTPs
  - 398,000 Server FTPs
    - Some GDGs
    - Majority Application data
      - .COPYLIB .DATALIB
      - .PDS .BATCH
      - .PROCLIB .JCL
      - .SOURCE .ISPSLIB
      - .DCLGEN .CARDS

OVERALL PROGRAMS RANKINGS

Program Rank	Program Name	Total CP CPU Time Captured	CP CPU TCB Service Units	Hour MSU	Total Excps Count	Total IO Connect Time
1	IKEF01	102:37:25.37	16589961256.38	16589.86	801487607	45:36:34.57
2	SAS	66:00:08.32	10419524190.00	10419.42	1129851815	174:26:42.83
3	ARCCTL	59:12:22:03	8081558881.00	8081.56	8346743531	930:32:12.34
4	FOCUS	37:24:47.01	5836759700.00	5836.76	1334424165	98:31:51.52
5	SASSHIS8	33:57:47.05	5082830500.00	5082.83	2042280392	151:01:27.73
6	ISRSUPC	19:13:16.16	3052551103.00	3052.55	257781061	18:06:34.11
7	SAM	15:33:48.68	2464326685.81	2464.33	56523023	21:13:01.39
8	IGG0ClX0	12:07:29.76	1920642597.00	1920.64	90204710	9:41:19.27
9	PG9635CP	9:27:10.32	1542521360.00	1542.52	54706683	2:54:07.59
10	BXM0I	9:40:45.32	1473664429.00	1473.76	44925518	1:23:56.89
11	UCC7	9:28:51.41	1391948024.00	1391.95	512902033	26:52:09.97
12	BXM9DT4	7:31:58.36	1220579006.63	1221.58	3367771	0:36:36.58
13	EV1212CP	6:15:58.57	1024186367.00	1024.19	15027111	0:59:01.49
14	DYC9XZ00	5:16:29.44	851452777.00	851.45	1462647	0:31:27.55
15	PG0625CP	5:09:04.78	820869908.00	820.87	158980302	10:11:36.55
16	PG0635CP	4:51:36.90	793168153.00	793.17	26527888	1:28:25.89
17	MVPMAIN	4:44:06.32	746546435.00	746.55	56028309	4:17:33.43
18	IXCINJST	6:53:30.73	706198933.00	706.20	71391000	17:31:25.42

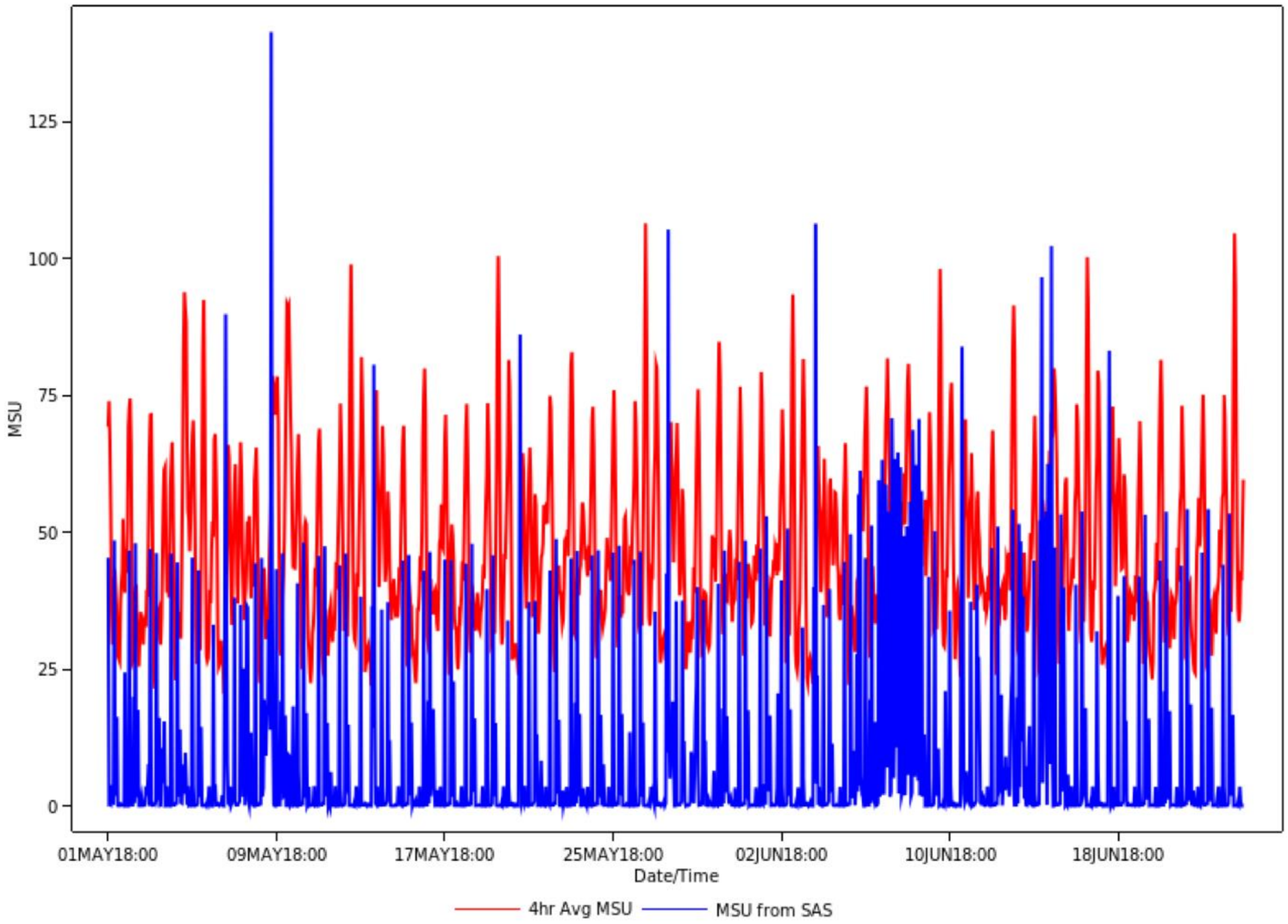
SAS is #2

TOP 9 INTERVALS PROGRAM RANKINGS

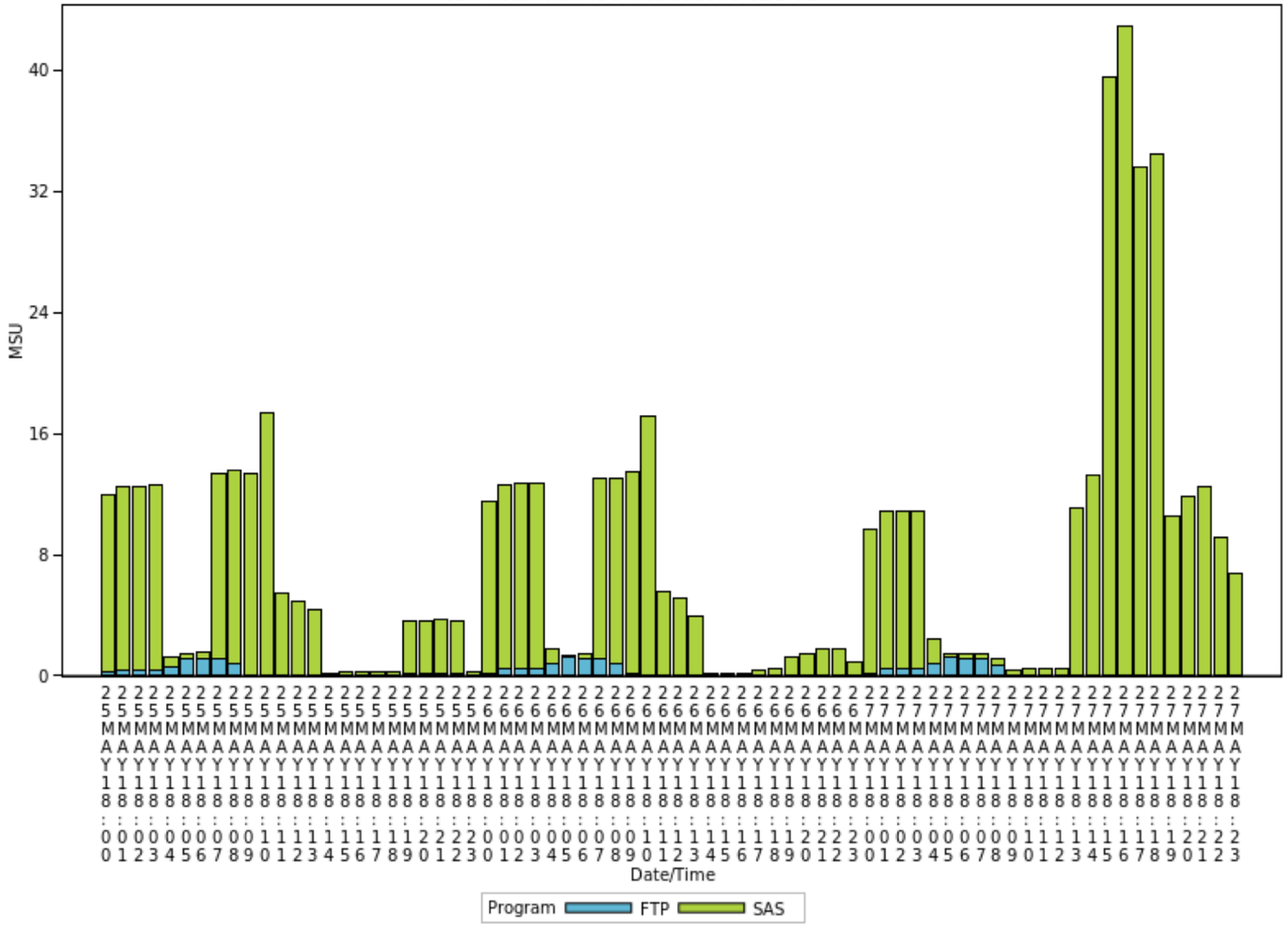
Interval Rank	Start of Interval	Program Rank	Program Name	Type of Task	Total CP CPU Time Captured	CP CPU TCB Service Units	Hour MSU	Total Excps Count	Total IO Connect Time	% of Total MSU	Total Consumed MSU
1	26MAY18:10:00	2	SAS	JOB	0:05:44.99	15281756.00	15.28	1072758	0:11:12.12	6.84	223.54
2	04MAY18:14:00	2	SAS	JOB	0:02:12.47	5988472.00	5.99	74831	0:00:34.28	2.72	220.07
3	19MAY18:10:10	2	SAS	JOB	0:05:43.24	15177127.00	15.18	1147785	0:11:14.65	7.18	211.50
4	12JUN18:23:00	2	SAS	JOB	0:09:24.02	24717549.00	24.72	2530379	0:29:55.25	11.88	207.98
5	12MAY18:10:00	2	SAS	JOB	0:05:36.00	14895766.00	14.90	985236	0:10:43.65	7.17	207.76
6	23JUN18:10:00	3	SAS	JOB	0:01:33.45	3946379.00	3.95	983782	0:08:13.90	1.90	207.44
7	23JUN18:11:00	2	SAS	JOB	0:06:16.02	16662336.00	16.66	1089805	0:11:41.76	8.16	204.12
8	02JUN18:10:00	2	SAS	JOB	0:06:40.92	17686546.00	17.69	1539799	0:14:25.26	8.77	201.73
9	05MAY18:10:00	2	SAS	JOB	0:05:25.61	14476203.00	14.48	768254	0:09:18.45	7.23	200.33

SAS and MXG used 18% of the processor every day from 8am to 6pm processing previous day's SMF records.

POTENTIAL MSU REDUCTIONS OVERLAY



POTENTIAL MSU SAVINGS

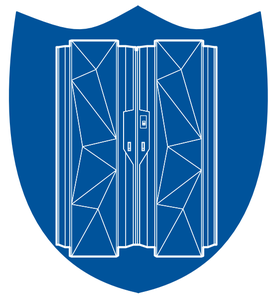


TOP 20 SAS PROGRAMS BY CPU TIME

System	Job	Readtime	Program	CPUunits	Avg Units	CPU Time	TCB Time	SRB Time	Excp Total
SYSB	AZM##23	13MAY2018:14:00:08.01	SAS	80464555	.	29:43.6	29:29.8	00:09.3	1888085
SYSB	AZM##23	17JUN2018:14:00:06.71	SAS	80458178	.	29:43.1	29:29.6	00:09.2	1913721
SYSB	AZM##23	10JUN2018:14:00:07.12	SAS	79738449	.	29:27.8	29:13.8	00:09.4	1880044
SYSB	AZM##23	06MAY2018:14:00:05.86	SAS	78880097	.	29:08.0	28:54.9	00:08.8	1861330
SYSB	AZM##23	27MAY2018:14:00:06.96	SAS	77446769	.	28:35.9	28:23.4	00:08.4	1846118
SYSB	AZM##23	20MAY2018:14:00:08.00	SAS	76660950	.	28:19.1	28:06.1	00:08.7	1831076
SYSB	AZM##23	03JUN2018:14:00:07.11	SAS	74656372	.	27:34.2	27:22.0	00:08.1	1787900
SYSB	Q9433HLQ	08MAY2018:18:54:27.39	SAS	64792660	.	23:46.4	23:45.1	00:00.9	153841
SYSB	Q943380S	14JUN2018:16:22:16.57	SAS	60591608	.	22:26.1	22:12.7	00:09.1	1532017
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	59721280	.	22:06.3	21:53.5	00:08.4	1656796
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	59374186	.	22:04.3	21:45.9	00:12.1	2360358
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	59328167	.	21:58.3	21:44.9	00:08.6	1773386
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	58920818	.	21:55.3	21:35.9	00:12.7	2426950
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	58749948	.	21:45.3	21:32.2	00:08.4	1696062
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	58544341	.	21:40.8	21:27.7	00:08.4	1662970
SYSB	Q943314S	05JUN2018:18:51:37.40	SAS	58217615	.	21:34.6	21:20.5	00:09.1	1938356
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	58156046	.	21:31.4	21:19.1	00:07.9	1747837
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	58081551	.	21:36.5	21:17.5	00:12.6	2509654
SYSB	Q943314S	06JUN2018:15:50:03.56	SAS	57775117	.	21:30.8	21:10.7	00:13.3	2525425

THE PLAN

- Move all “heavy-hitter” SAS/MXG jobs off the mainframe
  - Reduce MLC and SAS Institute software licensing costs
    - SAS license can be reduced on the mainframe
    - SAS can be licensed on the mainframe for remaining workloads
  - Free up expensive DASD storage by moving SMF and MXG PDB data to commodity storage
  - **Maintain or improve batch window**
  - **Ensure that MSU savings aren’t consumed by an increase in mainframe TCP/IP overhead (data transfer)**
- Maintain mainframe-centric job control and security



DATA TRANSFER OPTIONS

Method	Pros	Cons
FTP	▪ Free software	▪ Unsecure ▪ Slow ▪ Unreliable for large files ▪ Increases in MSUs ▪ Does not manage SAS execution
SFTP	▪ Free software (just pay for Digital Certificates) ▪ Secure	▪ Even slower than FTP ▪ Still unreliable for large files ▪ Complicated installation process ▪ Even greater increase in MSUs vs. FTP (30x) ▪ Does not manage SAS execution
Other TCP/IP-based Managed File Transfer Applications	▪ Secure	▪ Even slower than FTP ▪ Requires client license on SAS server ▪ Licensing bottlenecks (users/throughput) ▪ Software licensing costs ▪ Potentially more MSUs than SFTP ▪ Does not manage SAS execution
FICON Coprocessor	▪ Secure ▪ Fastest file transfers (up to 40x) ▪ Reliable for large files ▪ No licensing bottlenecks ▪ Near-elimination of MSUs for SAS processing ▪ Manages SAS execution	▪ Initial hardware cost (commodity server) ▪ Software licensing costs (flat rate, not based on size, users or throughput)

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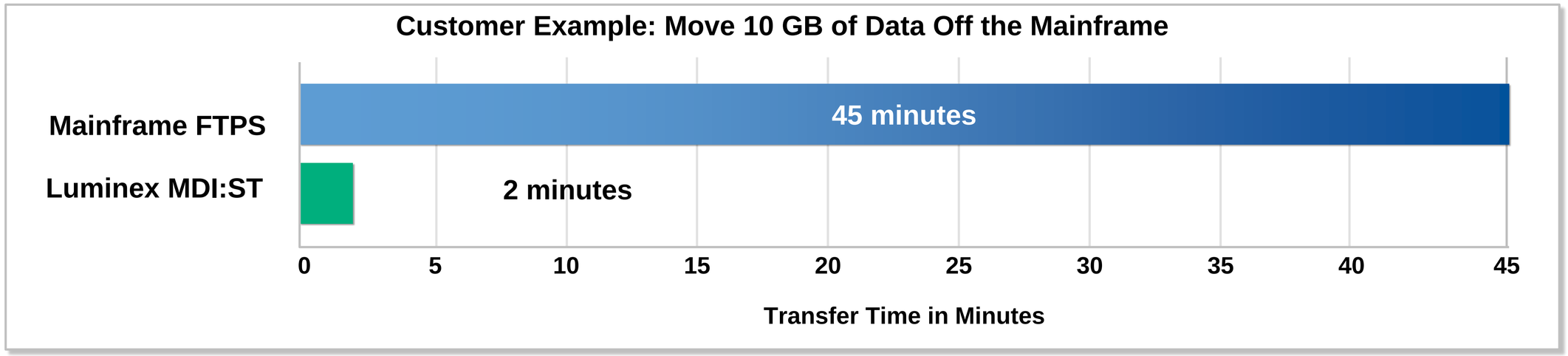
MDI TRANSFER COMPARISON

- Faster Data Transfer Rate
  - The FICON connection between the mainframe and the MDI platform copies large data files off the host faster and more securely than TCP/IP based protocols



- Large files are no longer an issue

COMPONENT LAYERS

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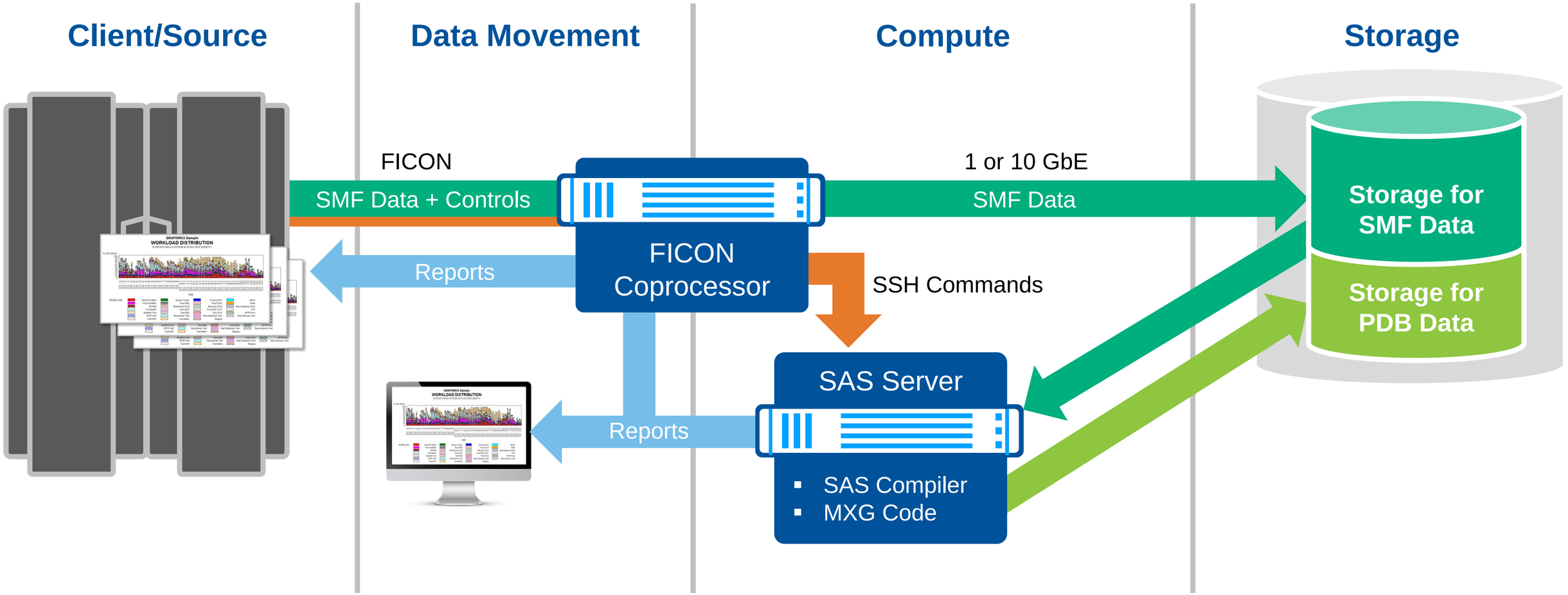

MIGRATION

- Identified all MXG related assets, workloads, users, data libraries, code libraries and SAS products
- Identified wasted resources that can be recovered through re-engineering or modernization
- Prioritized jobs for migration and identified jobs that can migrate immediately
- Assisted in designing migration plans with minimal impact
- Provided constant monitoring during migration to ensure all workloads have been migrated

WHAT WERE THE RESULTS?

$$$	Processing reduced to 26-28 minutes from 9 hours
$$$	Moved MXG processing completely off-host (18% Processor Usage)
$$	Added in DB2 detailed records
$	Moved SMF storage, MXG PDBs and workspace to commodity storage that was already on the floor
$	Removed many custom jobs to maintain trend PDBs
$$	4 Hr Rolling Average stayed the same (Latent Demand)

MDI IS A DATA TRANSFER & CO-PROCESSING PLATFORM

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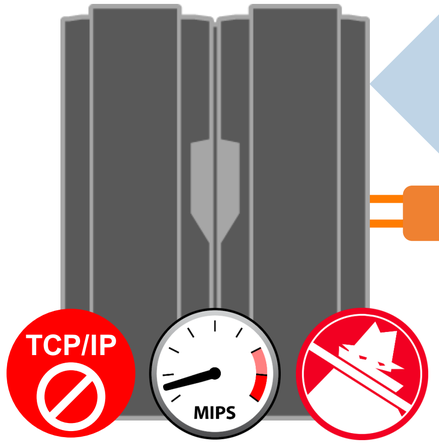
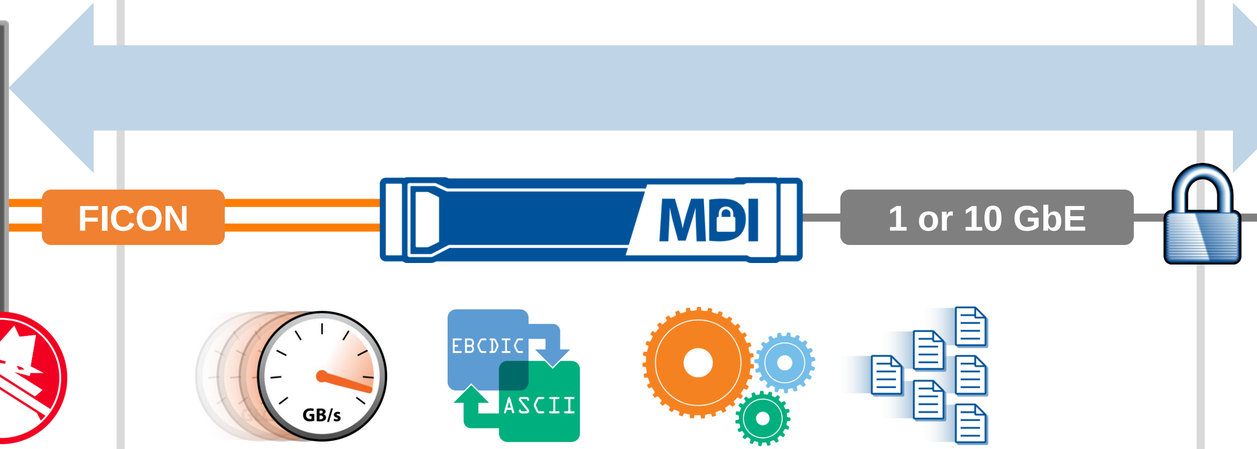
Mainframe FICON



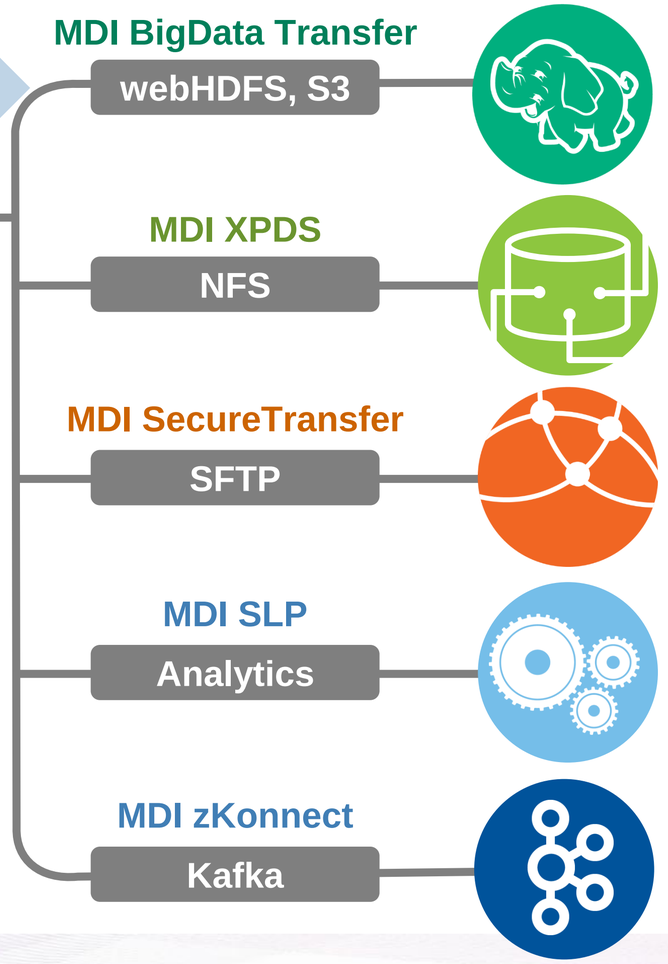
- Secure
- High speed
- Efficient, redundant I/O channels

MVT or Dedicated MDI Platform



- Profile-based architecture for extending processing & interface capabilities
- High speed, scalable transfer rates
- SAF integration & protocol-based encryption
- Bi-directional movement and communication for multi-platform workflows and co-processing
- Data translation / conversion

Data Sharing Targets/Sources



Q&A

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