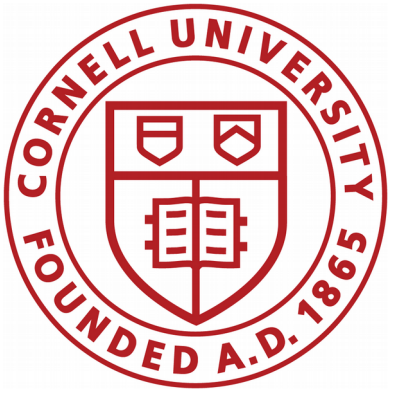



# CBPM Continuous Monitoring (CCM)

# – online display and SQL database –

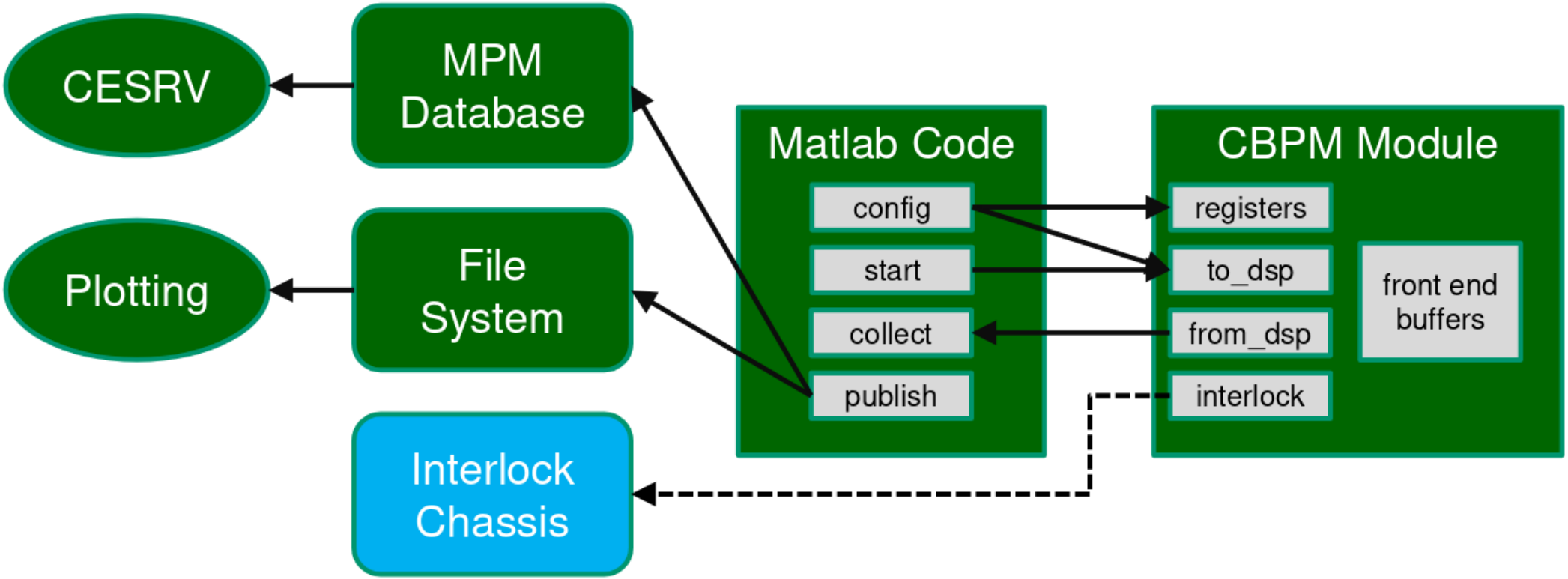
Antoine

CBPM meeting

March 6, 2020

# Overview flow of CCM

Flowchart of CCM system: from hardware to database and plotting

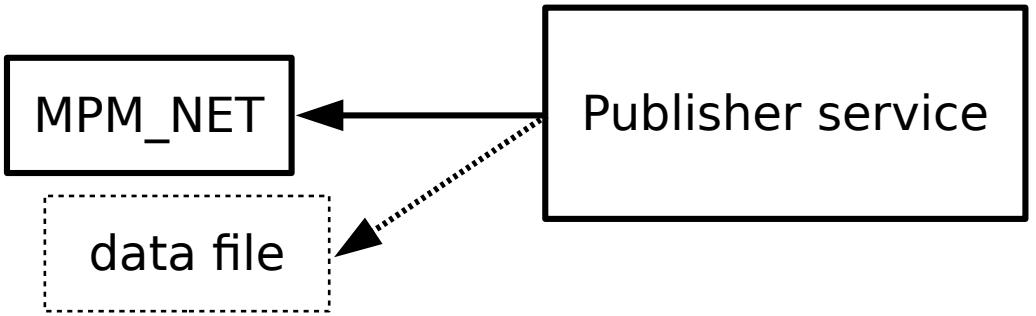



*from Nate's slides (machine study meeting 2020-02-20)*

# Proposal: SQL database in parallel to MPM_NET

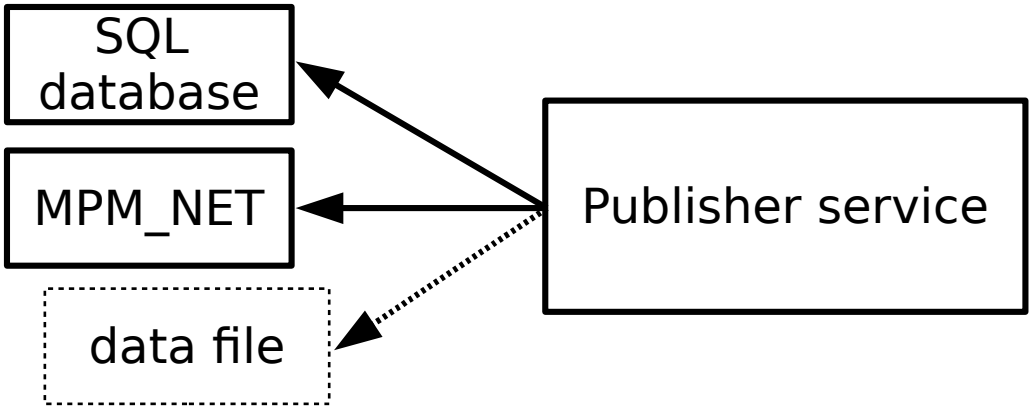
## Current

MPM_NET does not store history



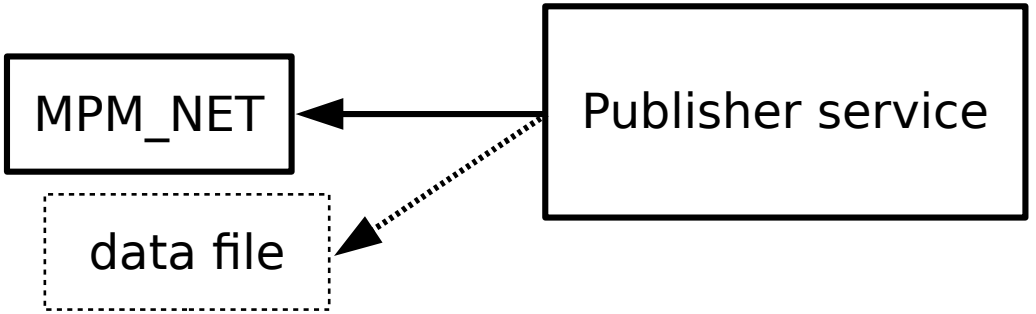

## Addition

SQL database keeps history and allows easy data manipulation for off-line and on-line analysis (no burden of dealing with data files)

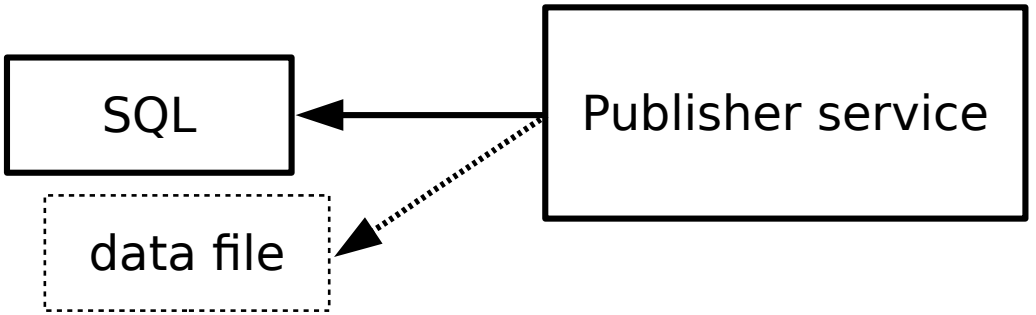


# Proposal: SQL database in parallel to MPM_NET

**A**




**B**




Worlds **A** and **B** are independent/parallel:

- ✗ all the currents capabilities (**A**) are un-touched
- ✗ new capabilities are being developed (**B**) in a clean slate environment → allows latest Python wonders

# Demo example from the web

https://dash-gallery.plotly.host/Portal/

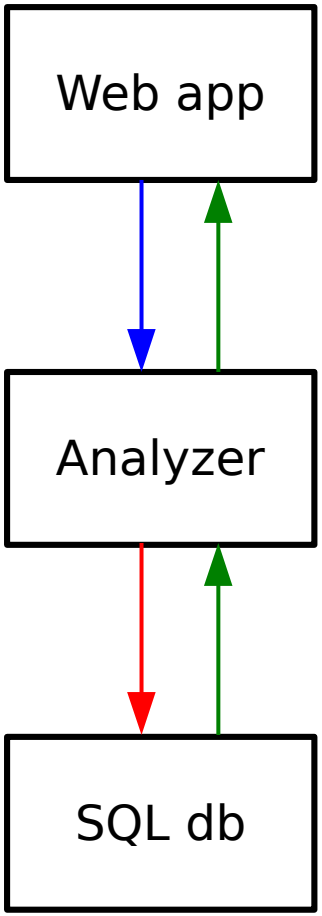
# CCM online display concept

The CCM online display is/has:

- ✗ web-browser based → can be accessed remotely from anywhere
- ✗ interactive user interface (plots, switches, sliders, tables, buttons…)
- ✗ display any information stored in the SQL database
- ✗ easy and tunable trend plot
- ✗ behind the scenes on-the-fly analysis (common code with off-line analysis)
- ✗ real-time (live) with auto-update
- ✗ it all lives in the Python world (except the SQL database)
- ✗ …

# Conceptual python flow

automatically or upon user request: ask analyzed data to display



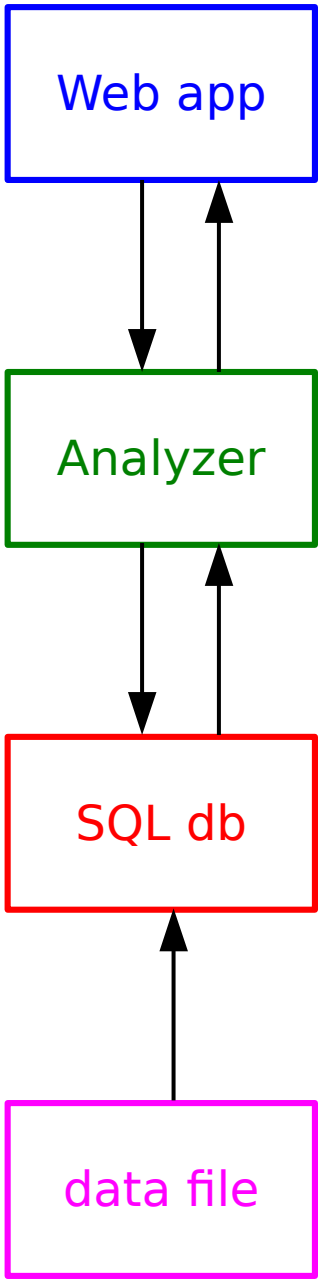

send data

upon analyzer request: query data to be analyzed

*Web app = web-browser live display*

*Analyzer = behind the scene on-the-fly analysis code*

# Current flow




python, dash, plotly (,flask, css, html)

python, pandas, sqlalchemy, numpy

postgreSQL

I work in a self-contained Anaconda3-5.2.0 environment that gives me full control and safety

# Accomplished so far – pSQL db

Created a local PostgreSQL service that runs on my desktop computer

```
(base) [atc93@lnx6248 anaconda3]$ postgres -D /home/atc93/atc93/postgresql_db/
2020-02-17 10:17:44.832 EST [28437] LOG:  listening on IPv6 address "::1", port 5432
2020-02-17 10:17:44.832 EST [28437] LOG:  listening on IPv4 address "127.0.0.1", port 5432
2020-02-17 10:17:44.840 EST [28437] LOG:  listening on Unix socket "/tmp/.s.PGSQL.5432"
2020-02-17 10:17:44.867 EST [28438] LOG:  database system was shut down at 2020-02-17 10:17:30 EST
2020-02-17 10:17:44.878 EST [28437] LOG:  database system is ready to accept connections
```

Created a “postgres” account

Created a databse called ‘test_ccm’

Create a table called “ccm”

Python code that automatically populates information from Nate’s new data file to database

# Accomplished so far – pSQL db

Terminal - atc93@lnx6248:~/atc93/CCMOD

File Edit View Terminal Tabs Help

atc93@lnx6248:~/atc93/anaconda3 | atc93@lnx6248:~ | atc93@lnx6248:~/atc93/CCMOD | atc93@lnx6248:~/atc93/CCMOD/before_bootstrap

```
(base) [atc93@lnx6248 CCMOD]$
(base) [atc93@lnx6248 CCMOD]$ psql test_ccm
psql (11.2)
Type "help" for help.

test_ccm=# \dt
        List of relations
 Schema | Name | Type  |  Owner
--------+------+-------+---------
 public | ccm  | table | antoine
(1 row)

test_ccm=# SELECT * FROM ccm;
 level_0 | index | bunch_id | top_in  | bot_in  | bot_out | top_out |  cbpm_x  | cbpm_y  | compare_x | compare_y | data_counter |        timestamp
---------+-------+----------+---------+---------+---------+---------+----------+---------+-----------+-----------+--------------+-------------------------
       0 |     1 |        1 | 14396.1 | 16622.7 | 12849.3 | 13663.6 |  -2028.5 | -486.05 |         0 |         0 |        33135 | 2020-02-24 11:22:48.417
       1 |     2 |        1 | 14392.1 |   16621 | 12853.9 | 13666.1 |  -2022.7 | -487.57 |         0 |         0 |        33136 | 2020-02-24 11:22:48.43
       2 |     3 |        1 | 14392.1 |   16621 | 12853.9 | 13666.1 |  -2022.7 | -487.57 |         0 |         0 |        33136 | 2020-02-24 11:22:48.442
       3 |     4 |        1 | 14393.6 | 16617.3 |   12853 | 13667.6 | -2021.49 | -484.99 |         0 |         0 |        33137 | 2020-02-24 11:22:48.453
       4 |     5 |        1 | 14392.3 | 16615.9 | 12853.6 | 13666.4 | -2020.63 | -485.58 |         0 |         0 |        33138 | 2020-02-24 11:22:48.467
       5 |     6 |        1 | 14390.6 | 16619.3 | 12855.7 | 13665.4 | -2020.82 | -488.37 |         0 |         0 |        33139 | 2020-02-24 11:22:48.478
       6 |     7 |        1 | 14390.6 | 16619.3 | 12855.7 | 13665.4 | -2020.82 | -488.37 |         0 |         0 |        33139 | 2020-02-24 11:22:48.491
       7 |     8 |        1 | 14392.1 | 16617.1 | 12852.3 | 13663.3 | -2023.18 | -486.72 |         0 |         0 |        33140 | 2020-02-24 11:22:48.503
       8 |     9 |        1 | 14393.4 | 16615.5 |   12852 |   13664 | -2022.87 | -485.37 |         0 |         0 |        33141 | 2020-02-24 11:22:48.516
       9 |    10 |        1 | 14393.4 | 16615.5 |   12852 |   13664 | -2022.87 | -485.37 |         0 |         0 |        33141 | 2020-02-24 11:22:48.528
      10 |    11 |        1 | 14393.2 | 16617.2 | 12851.5 | 13663.8 | -2023.85 | -485.86 |         0 |         0 |        33142 | 2020-02-24 11:22:48.54
      11 |    12 |        1 | 14391.2 | 16619.7 |   12854 | 13662.6 |  -2023.4 |  -488.7 |         0 |         0 |        33143 | 2020-02-24 11:22:48.552
      12 |    13 |        1 | 14391.2 | 16619.7 |   12854 | 13662.6 |  -2023.4 |  -488.7 |         0 |         0 |        33143 | 2020-02-24 11:22:48.568
      13 |    14 |        1 |   14392 | 16618.5 | 12853.9 | 13663.7 | -2022.73 |  -487.6 |         0 |         0 |        33144 | 2020-02-24 11:22:48.578
      14 |    15 |        1 | 14392.4 | 16618.7 | 12853.6 | 13664.2 | -2022.91 | -487.22 |         0 |         0 |        33145 | 2020-02-24 11:22:48.59
      15 |    16 |        1 | 14392.1 | 16616.9 | 12854.1 |   13666 | -2020.92 |  -486.3 |         0 |         0 |        33146 | 2020-02-24 11:22:48.603
      16 |    17 |        1 | 14392.1 | 16616.9 | 12854.1 |   13666 | -2020.92 |  -486.3 |         0 |         0 |        33146 | 2020-02-24 11:22:48.615
      17 |    18 |        1 | 14390.7 | 16617.6 |   12855 | 13665.8 |  -2020.3 | -487.38 |         0 |         0 |        33147 | 2020-02-24 11:22:48.627
      18 |    19 |        1 | 14392.6 | 16615.5 | 12853.7 | 13665.4 | -2021.04 | -485.71 |         0 |         0 |        33148 | 2020-02-24 11:22:48.641
      19 |    20 |        1 | 14392.6 | 16615.5 | 12853.7 | 13665.4 | -2021.04 | -485.71 |         0 |         0 |        33148 | 2020-02-24 11:22:48.652
      20 |    21 |        1 | 14390.8 | 16614.2 | 12855.8 | 13667.9 | -2017.47 | -485.74 |         0 |         0 |        33149 | 2020-02-24 11:22:48.665
      21 |    22 |        1 | 14393.8 | 16617.2 | 12851.7 | 13664.5 | -2023.63 | -485.52 |         0 |         0 |        33150 | 2020-02-24 11:22:48.676
      22 |    23 |        1 | 14393.8 | 16617.2 | 12851.7 | 13664.5 | -2023.63 | -485.52 |         0 |         0 |        33150 | 2020-02-24 11:22:48.689
      23 |    24 |        1 | 14393.2 | 16619.2 | 12851.2 | 13661.3 | -2026.02 | -487.31 |         0 |         0 |        33151 | 2020-02-24 11:22:48.701
      24 |    25 |        1 | 14393.3 | 16619.7 | 12852.3 | 13662.7 | -2025.01 | -487.34 |         0 |         0 |        33152 | 2020-02-24 11:22:48.713
      25 |    26 |        1 | 14393.3 | 16619.7 | 12852.3 | 13662.7 | -2025.01 | -487.34 |         0 |         0 |        33152 | 2020-02-24 11:22:48.727
      26 |    27 |        1 | 14392.1 | 16615.8 | 12853.7 | 13666.2 | -2020.55 | -485.66 |         0 |         0 |        33153 | 2020-02-24 11:22:48.738
      27 |    28 |        1 |   14389 | 16617.3 | 12857.7 | 13668.5 | -2016.85 |  -487.8 |         0 |         0 |        33154 | 2020-02-24 11:22:48.75
      28 |    29 |        1 |   14389 | 16617.3 | 12857.7 | 13668.5 | -2016.85 |  -487.8 |         0 |         0 |        33154 | 2020-02-24 11:22:48.762
      29 |    30 |        1 | 14389.4 | 16618.2 | 12855.9 | 13665.5 | -2019.74 | -488.47 |         0 |         0 |        33155 | 2020-02-24 11:22:48.774
      30 |    31 |        1 | 14389.6 | 16618.7 | 12855.7 | 13666.1 |  -2019.8 | -488.26 |         0 |         0 |        33156 | 2020-02-24 11:22:48.786
      31 |    32 |        1 | 14389.6 | 16618.7 | 12855.7 | 13666.1 |  -2019.8 | -488.26 |         0 |         0 |        33156 | 2020-02-24 11:22:48.798
      32 |    33 |        1 | 14393.2 | 16616.9 |   12853 | 13667.1 | -2021.37 | -485.14 |         0 |         0 |        33157 | 2020-02-24 11:22:48.809
```

# Accomplished so far – Analyzer

Query (read) pSQL db using pandas/sqlalchemy

Select range of data according to timestamp and store in pandas frame

Data analysis

# Accomplished so far – Web app

Running locally on my desktop computer

Interacts with the Analyzer to request range of data (timestamp) to be displayed

Can start/stop live update

Minimalist display:

- ✗ some text
- ✗ some plots
- ✗ some interactive user interface

So far this is the most challenging/time-consuming piece of the project

# Accomplished so far – Web app

Display can be accessed your web-browser:

- ✗ port forwarding between your computer and my desktop computer:
  - ➢ `ssh -L 9000:localhost:8050 user_name@lnx6248`
- ✗ open web-browser and go the the address: `localhost:9000`

# Additional materials