

EPA's New Emissions Modeling Framework

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Marc Houyoux
houyoux.marc@epa.gov
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Credits

- This presentation was adapted from a longer version with the following developers and commenters:
 - Emissions, Modeling, and Analysis Division (EMAD): Madeleine Strum, Norm Possiel, Rich Mason*, Doug Solomon, Phil Lorang, Tyler Fox
 - Air Quality Strategies and Standards Division (AQSSD): Larry Sorrels, Art Rios, Darryl Weatherhead
 - Office of Research and Development (ORD): Bill Benjey*, George Pouliot*, Dan Loughlin

* On assignment to EPA from NOAA, Atmospheric Sciences Modeling Division

Overview

- Motivations
- What is the Emissions Modeling Framework (EMF)?
- Hardware needs
- Expected uses in EPA
- Expected benefits to modeling community
- Status and timeline

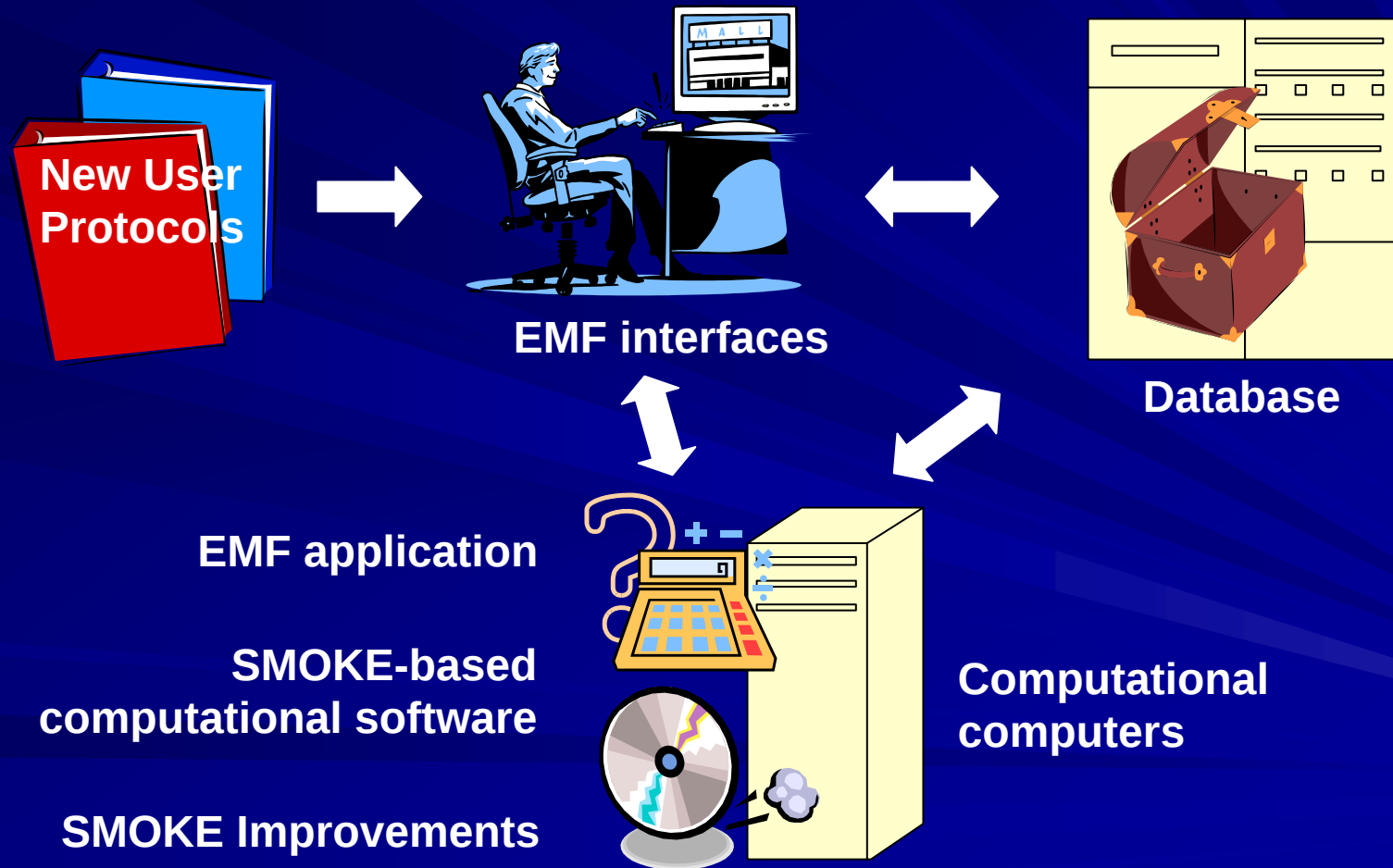
Motivations

- Improve quality, consistency across programs, transparency and prevent mistakes in emissions modeling at EPA
 - For air quality modeling
 - For other purposes, e.g., Trends Reports, PM/Ozone brochures
- Better handle emissions modeling complexity
 - Many areas of expertise coming together into a “single” step (e.g., inventories, chemistry, meteorology, data handling)
 - Emissions modelers put together data sources from many disparate sources, but need a polished result
 - At EPA, different people do different parts (multi-user environment), sometimes across Divisions and Offices
- Provide a tool for the modeling community

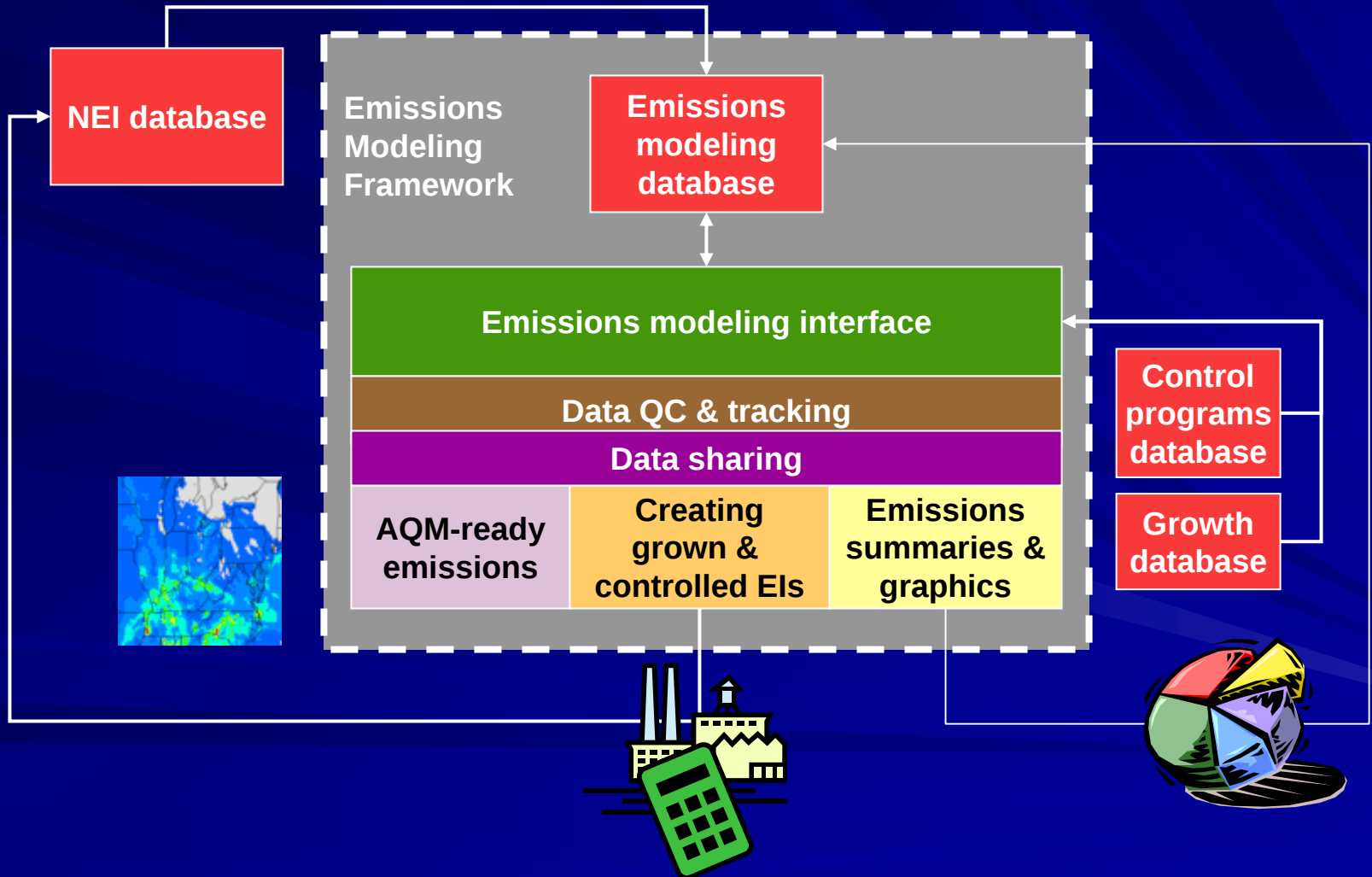
What is the EMF?

- Software you access from your desktop, with:
 - Protocols for high-quality and timely emissions modeling (definable by user)
 - SMOKE GUI: Tool for setting up, managing SMOKE runs & run SMOKE in multi-computer environment
 - Tool for managing emissions modeling data in a multi-user environment
- Access point for emissions results
- Integrated criteria/PM/toxics emissions modeling platform for both grid-based and dispersion models
- QA will be tightly integrated with EmisView tool

Emissions Modeling Framework



Emissions Modeling Framework



Data Management (1)

- Perform emissions modeling consistently across projects with diverse purposes
- Share data in a multi-user environment
 - Version control, problem tracking, record keeping for changes, metadata entry and review
 - Notification of data changes by “subscription”
- QA protocols: automate where possible and integrate closely with data
- Facilitate blending of multiple data sources

Data Management (2)

- Help prevent data handling and quality errors
- Store SMOKE emissions modeling data inputs in a shared database
 - Master data in central location
 - Multi-user approach allows accessing the same information across EPA
- Create spatial surrogates, speciation data, land use, & other SMOKE inputs from raw data
- Future: automated database coordination with EPA's new NEI data system

Case Management (1)

- Case is a run to create a emissions modeling output
 - SMOKE input data (e.g., speciation or spatial inputs)
 - Grown and/or controlled inventory
 - Full set of model-ready inputs for entire episode
- Provide SMOKE interface with a much shorter learning curve than script-based approach
 - Setup based on real-world decisions, not SMOKE settings (e.g., user specifies what AQ model, what chemical mechanism, what time period)
 - Can run for all sectors and an entire episode in a single “case”

Case Management (2)

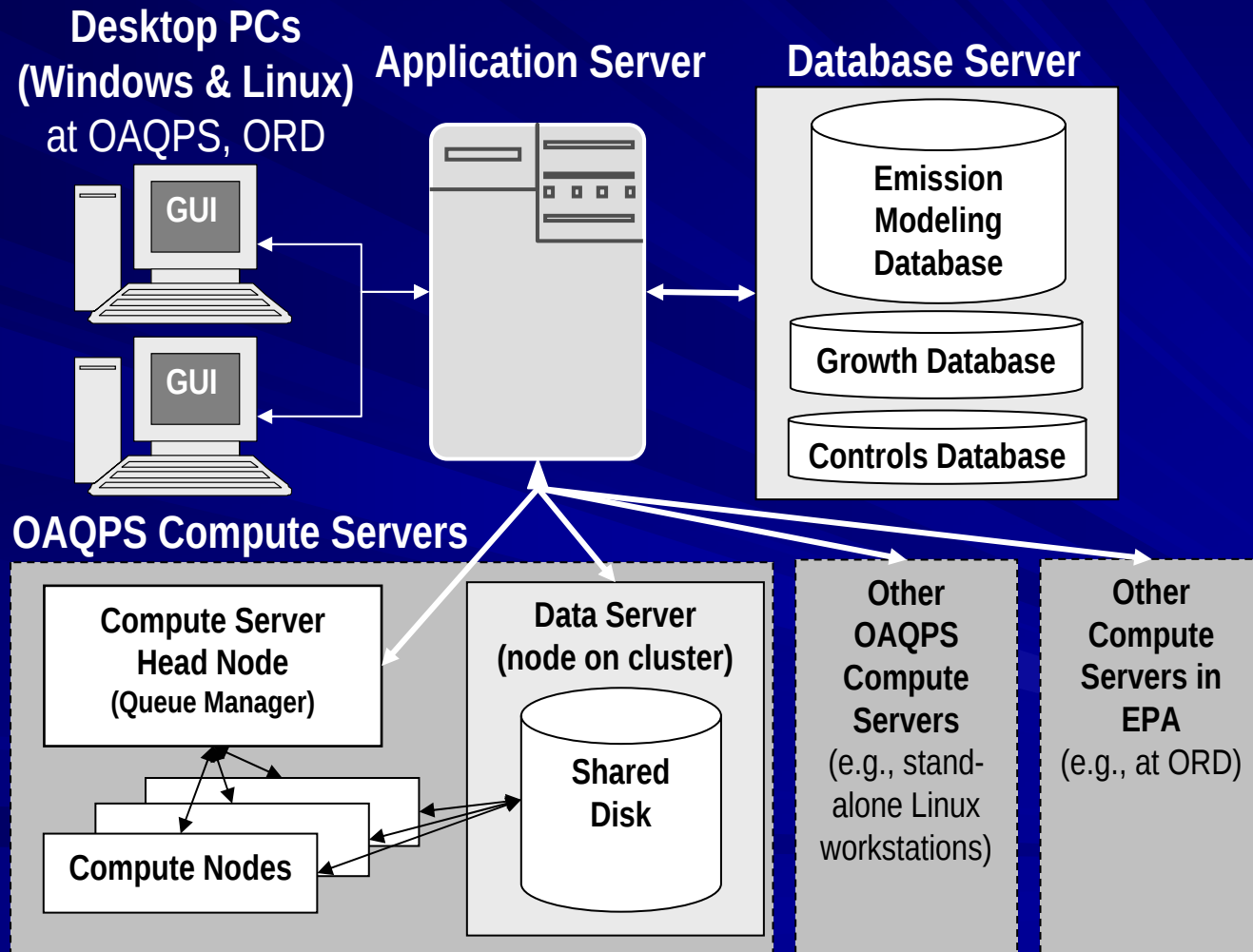
- Fosters reuse and coordination of emissions modeling cases
- Notify case creators of data updates by other users for data they are using
- QA protocols: automated and integrated with case setup and use
- SMOKE support for CMAQ, CAMx, REMSAD, ASPEN, and AERMOD
- More robust tools for future-year projection

Emissions Modeling Framework

What will the EM database include?

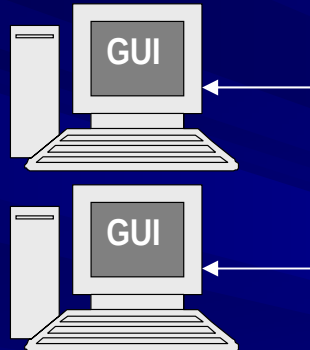
- Emissions modeling ancillary files (e.g., chemical speciation data, spatial surrogates)
- Emission modeling case configuration details (e.g., grid, time period, input files used)
- Some emissions summaries and reports for reuse
- Metadata for data and cases
 - Origin, history (including QA), & documentation (including links to documents), access history, purposes for use
 - Data status (including QA) & fate
 - Who can access file and for what purpose
- At least phase 1: Copies of relevant parts of inventories for emissions modeling (before new NEI data system)

EPA hardware configuration

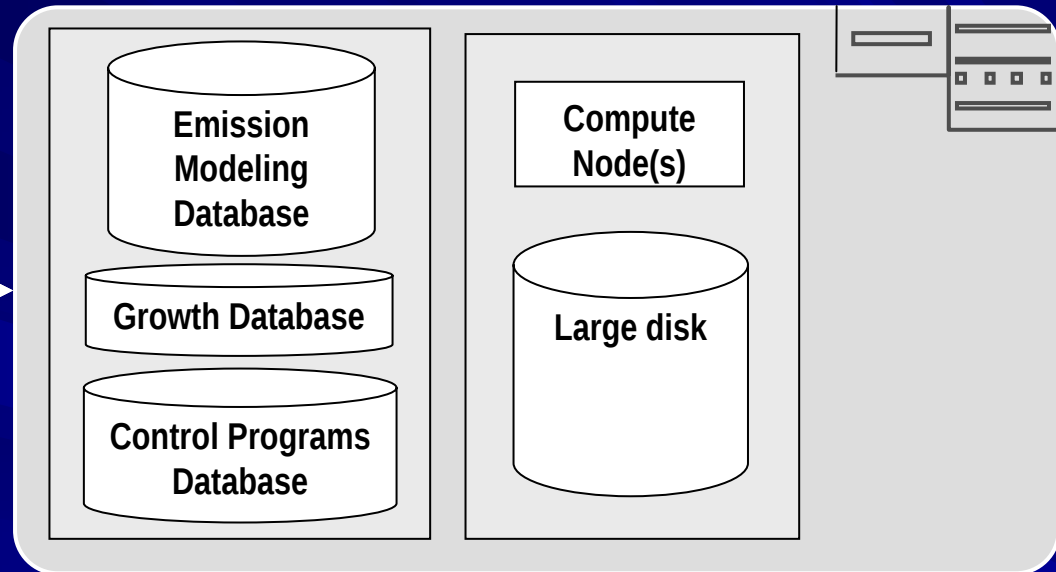


Alternative hardware configuration

Desktop PCs
(Windows & Linux)



Application, Database, and Compute Server



**Example of simpler hardware configuration
supported by EMF flexible design**

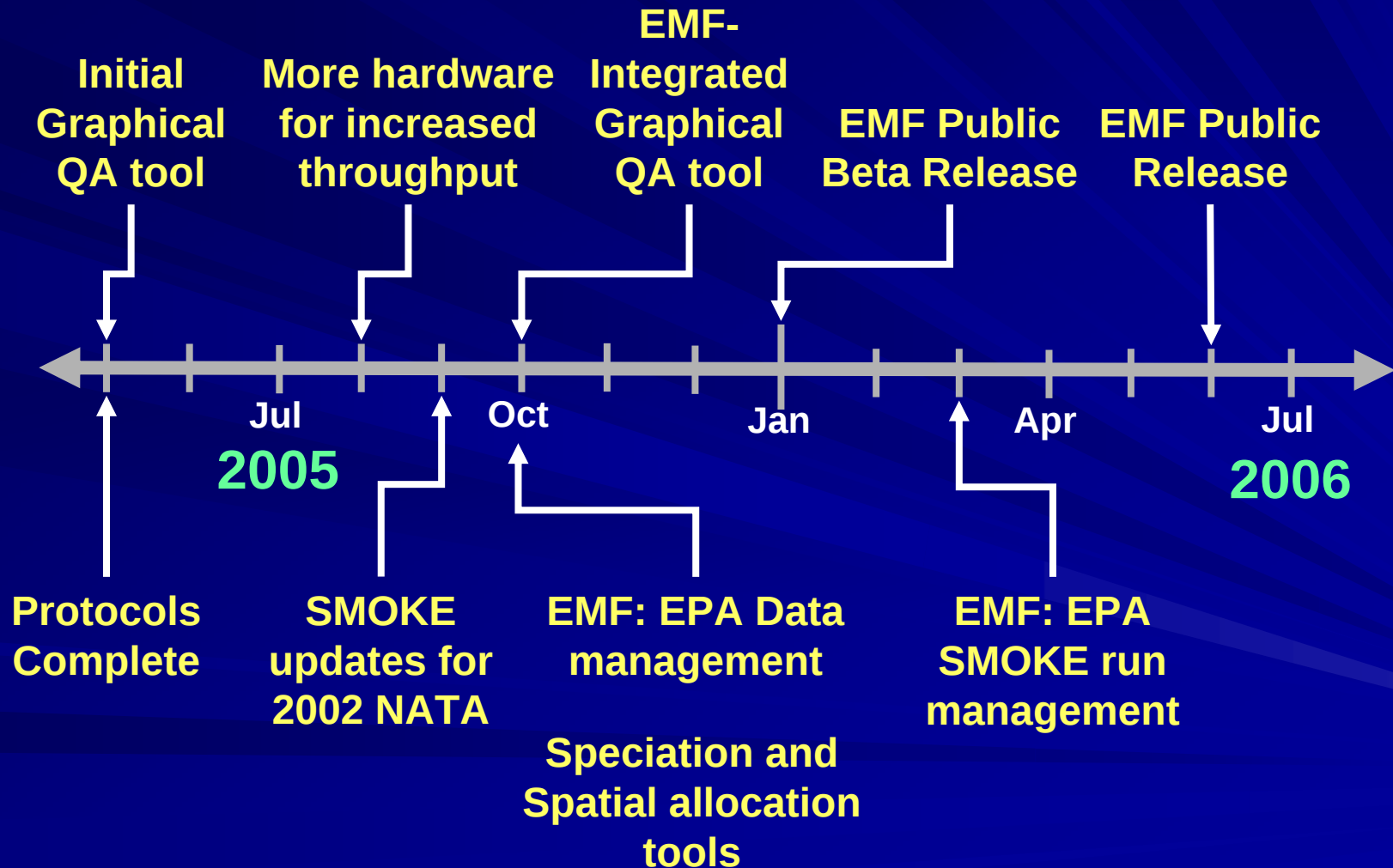
Expected uses in EPA

- Access by all of EPA to obtain emissions modeling data & information for both criteria and toxics
- EPA staff will be able to obtain descriptive information about emissions inputs for added transparency
- Economists and other analysts (not SMOKE experts) will be able to generate their own projected inventories
- EPA employees and contractors will be able to obtain and prepare data summaries of speciated and temporally allocated emissions
- Emissions modelers will be able to prepare, QA, and track emissions data for AQ models in a more transparent way

Expected benefits to community

- Although EMF is being developed first as an EPA resource, we are planning also to make it useable and available outside of EPA
- A new emissions data management resource
- A new emissions modeling QA resource
- Tools to create criteria/toxics speciation and spatial surrogate data independent of SMOKE
- Help run SMOKE
 - AQ model preparation (criteria/PM/toxics)
 - Future-year inventories
 - Data summaries and analysis

Project benefits timeline



Status

- Now accepting input, needs, and questions from outside EPA to improve end result
- High-level design is complete
- QA protocols in development by EPA staff
- Planned first applications are:
 - 2002 12-km criteria, PM, toxics CMAQ modeling
 - 2002 National Air Toxics Assessment
- Detailed design underway
- EmisView will have added functionality due to this effort

Disclaimer

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