MODEL PERFORMANCE ASSESSMENT AND ONGOING MONITORING

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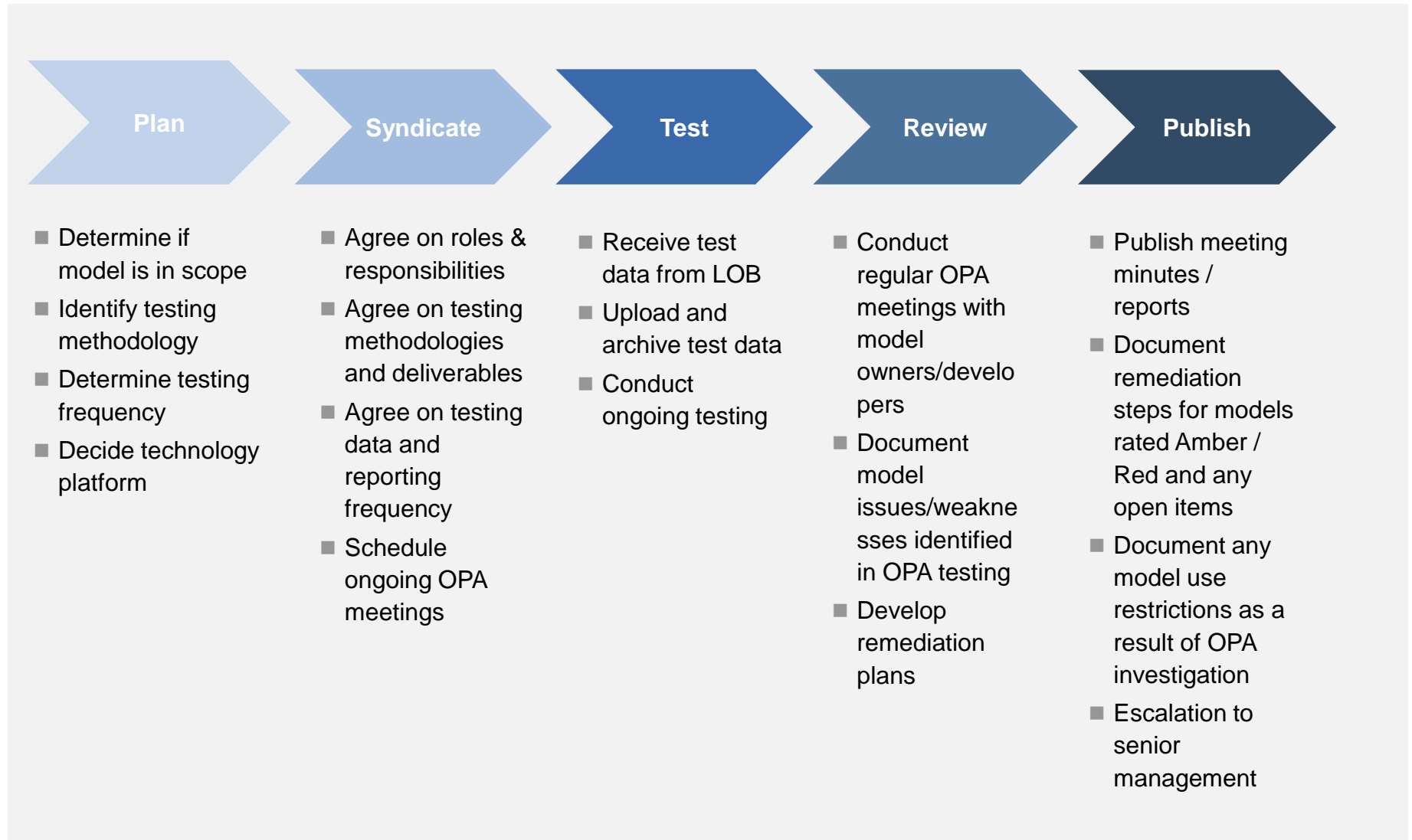
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Model Performance Assessment and Ongoing Monitoring is a **critical component** of effective model risk management

Models used in production must be subject to ongoing testing, to confirm that they continue to be fit for the purposes for which their usage has been approved (e.g., valuation; risk management; stress).   Adverse test results require close examination and may lead to follow up steps to enable remediation.

- **Ongoing Performance Assessment, or "OPA",** is an **independent** model performance testing and assessment process conducted on regular basis to evaluate the performance of Tier 1, Tier 2 and Tier 3 models that have been approved for use by Model Risk

- OPA is a function within the Model Risk Department, with participation from other stakeholders, such as QR and model owners, users, and developers across the firm

- OPA is mandated by the JPMorgan Chase Estimations and Model Risk Management Policy. OPA is an important independent model risk ongoing monitoring and management function that **complements** the initial model review/validation conducted by Model Risk.

- Additionally, OPA is an **ongoing "effective challenge"** for models after they are released into production. Conducted regularly throughout the year, OPA provides early warning for potential model issues and weaknesses, to ensure model risk is timely identified and effectively managed in ongoing basis.
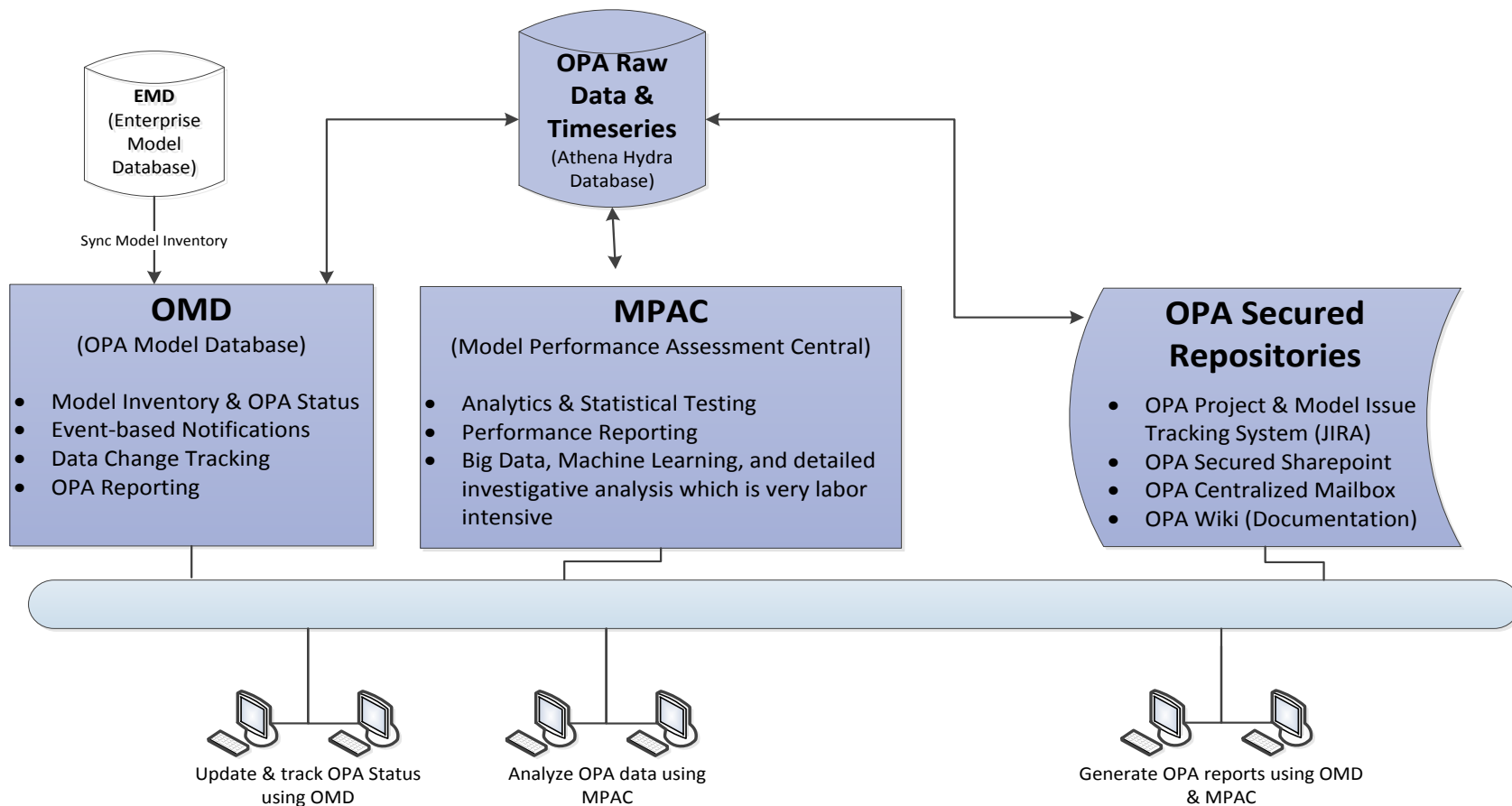
Ongoing Performance Assessment (OPA) Process

Plan	Syndicate	Test	Review	Publish
■ Determine if model is in scope ■ Identify testing methodology ■ Determine testing frequency ■ Decide technology platform	■ Agree on roles & responsibilities ■ Agree on testing methodologies and deliverables ■ Agree on testing data and reporting frequency ■ Schedule ongoing OPA meetings	■ Receive test data from LOB ■ Upload and archive test data ■ Conduct ongoing testing	■ Conduct regular OPA meetings with model owners/developers ■ Document model issues/weaknesses identified in OPA testing ■ Develop remediation plans	■ Publish meeting minutes / reports ■ Document remediation steps for models rated Amber / Red and any open items ■ Document any model use restrictions as a result of OPA investigation ■ Escalation to senior management

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Categories of OPA Testing Methodologies

Hedging Residuals	Evaluates the performance of a model by testing the PnL of a hypothetical hedged portfolio consisting of the exotic products and the vanilla hedging instruments. ■ If the time-series of residual PnL of the hedged portfolio exhibits anomalous behavior, OPA team will perform further investigation to determine if these are indicative of potential model performance issues.
Predicted vs Actual (Backtesting)	Based on comparing realized outcomes against predictions by model.
Benchmarking	Comparison of a given production model's outputs to alternative similar internal or external model (benchmark model). ■ If the difference of production model and benchmark model exceeds the predefined OPA thresholds, it indicates potential model performance issues, thus warrants further investigation.

Other Periodic Analysis	Used where the nature of the model does not lend itself to one of the above approaches.
	■ Such models are subject to a periodic analysis in order to verify the model is performing as expected. The techniques adopted by the OPA team to perform the Other Periodic Analysis include (but are not limited to):
	   – Calibration Test – Assessment of Desired Properties
	   – Variance Analysis – Robustness Test
	   – Convergence Test

Robust Testing Infrastructure and Issue-Tracking System

1. OMD (OPA Model Database) application consolidates OPA data in a centralized database. This application includes a front-end GUI to interact with OPA data, provides OPA reporting for senior management, features notification mechanism when OPA data is updated, etc. OMD is developed within Athena environment and uses Athena Hydra Databases as storage medium.

2. MPAC (Model Performance Assessment Central) is a centralized toolkit in Athena for ongoing model performance monitoring, testing, analysis, & reporting.

3. JIRA is a proprietary issue tracking system widely used within J.P. Morgan. OPA team uses JIRA for tracking issues and managing projects.

4. Athena Hydra servers are the main storage databases used for storing OPA data. OMD, MPAC, and almost all of OPA tools use Hydra to persist information.

EMD
(Enterprise Model Database)

Sync Model Inventory

OPA Raw Data & Timeseries
(Athena Hydra Database)

OMD
(OPA Model Database)

- Model Inventory & OPA Status
- Event-based Notifications
- Data Change Tracking
- OPA Reporting

MPAC
(Model Performance Assessment Central)

- Analytics & Statistical Testing
- Performance Reporting
- Big Data, Machine Learning, and detailed investigative analysis which is very labor intensive

OPA Secured Repositories

- OPA Project & Model Issue Tracking System (JIRA)
- OPA Secured Sharepoint
- OPA Centralized Mailbox
- OPA Wiki (Documentation)

Update & track OPA Status using OMD

Analyze OPA data using MPAC

Generate OPA reports using OMD & MPAC

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As a result of independent OPA testing and assessment, RAG ratings are assigned to models to **drive corrective action**

A model is RAG-rated Red, Amber, Green according to its performance testing results and related exposure

Amber	Red
■ Closely monitor the issues in ongoing basis	■ Open Action Plan to track the resolution
■ Investigate to find out root cause	■ Establish trading controls, as appropriate
■ Agree with developers/users on solution/timetable to fix the problem	■ Adjust reserve (Valuation models), as appropriate
■ Implement any control, as needed, if the business will continue to use the model	■ Build new / improved model to replace the existing model within an agreed timeframe, as appropriate
■ Notify business heads and provide appropriate reporting	■ Notify business heads and provide appropriate reporting

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OPA Escalation Procedure and Communication to Senior Management

Communication of OPA Issues & Red/Amber Models	Publish OPA Reports
■ Chief Risk Officers at LoB-level are notified on a monthly basis regarding all Amber and Red models in their respective LoBs	■ The OPA team holds regular meetings with model developers/users to review OPA validation results, discuss issues identified in OPA testing, and agree on action plans and timelines to address model performance issues
■ Red and Amber models are highlighted in regular Control Committee meetings	■ OPA reports are published by OPA team on regular basis. The outstanding OPA issues are tracked through JIRA tickets and/or Action Plans (APs) to make sure the identified issues are remediated timely
■ Red and Amber models are reviewed with the Head of Model Risk, Head of CIB-QR and Head of CCB-QR on a quarterly basis	
■ Head of CIB-QR and Head of CCB-QR are included in the published OPA reports for models in their respective areas, which list all identified model-related issues	
■ Senior Trading Heads are included in the published OPA reports for trading models used in their respective areas	
■ Valuation Control Group (VCG), Market Risk, and Audit are also included in the published OPA reports	
■ OPA Red and Amber models are highlighted to senior management through the monthly Board of Director's Key Risk Summary report	

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