

Extending the Digital Thread/Twin to the Supply Chain

What can we do today...?

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ELYSIUM

Parker Aerospace

NORTHROP GRUMMAN

BOEING

ELYSIUM

Parker Velocity

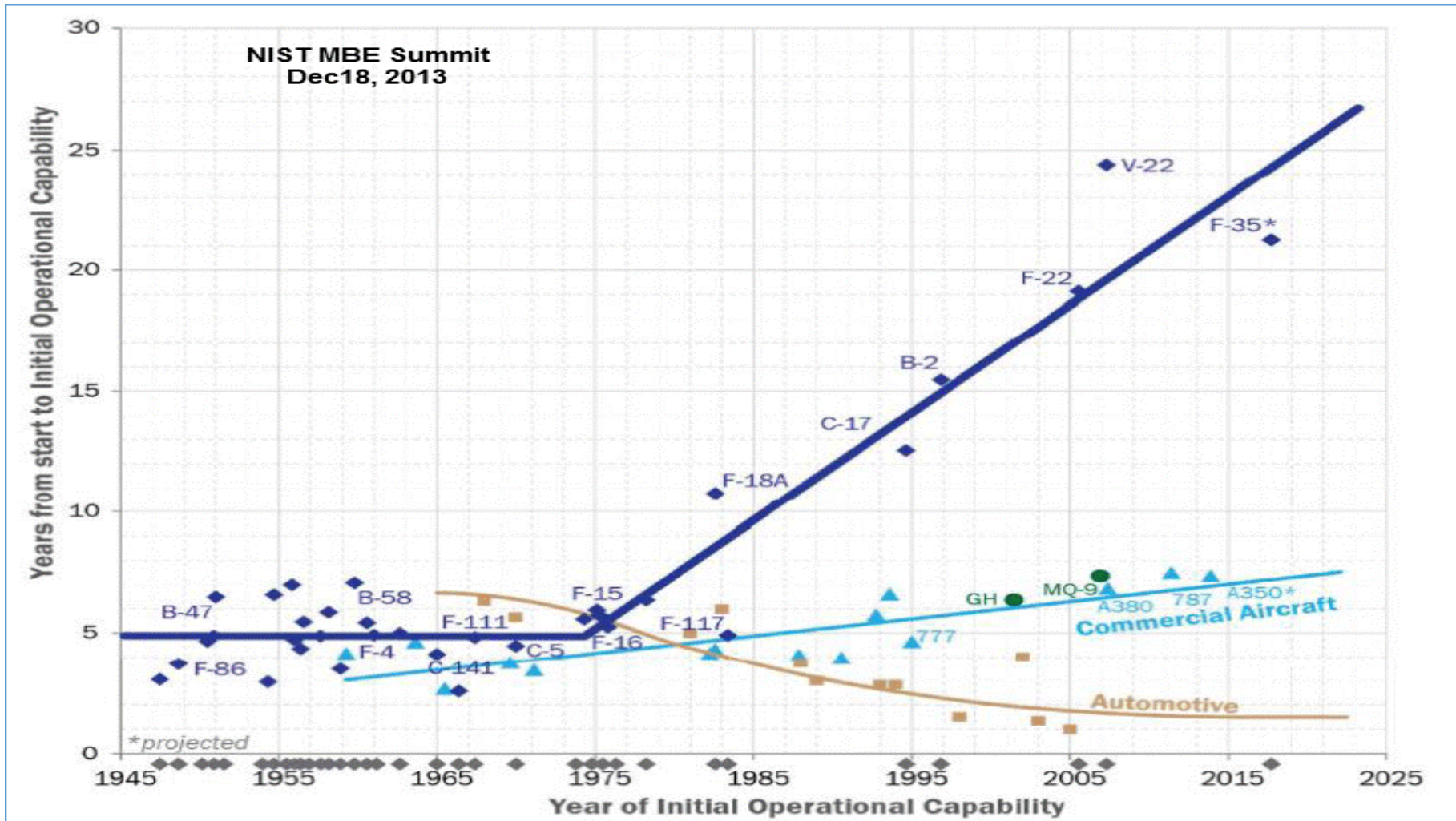
NORTHROP GRUMMAN

BOEING



Why a Digital Thread? (because aircraft dev is hard!)

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Why a Digital Thread? (because aircraft dev is expensive!)

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Aerospace technology is expensive



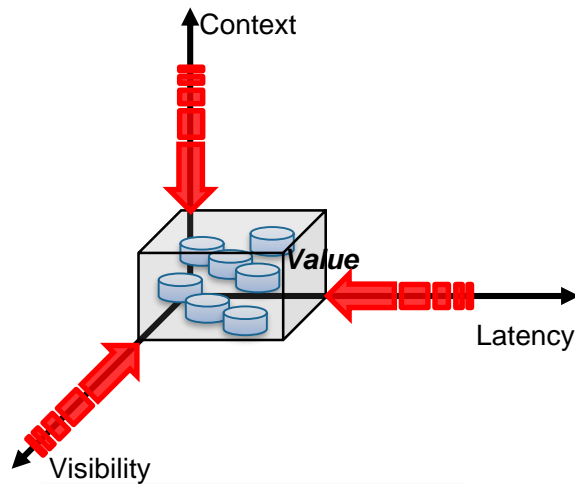
*Pound for Pound by weight
An aero-engine has the same
value as silver*



*Pound for Pound by weight
A motorcar has the same
value as hamburger*

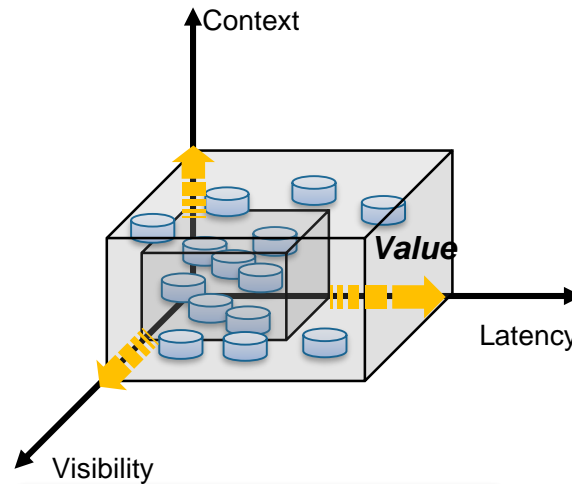
Digital Assets Value Evolution

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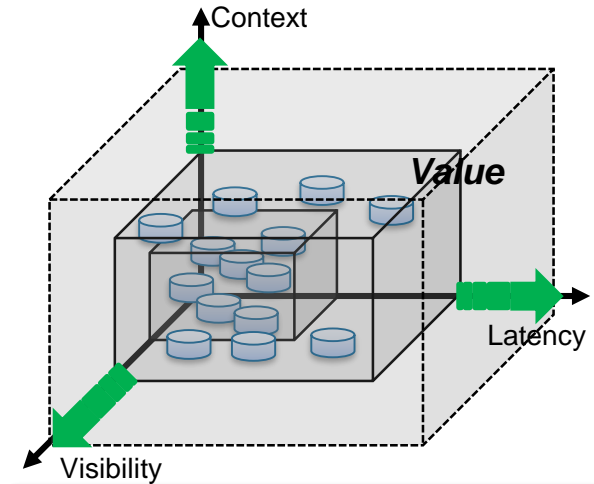
Data Authoring Focus

- “Data Authors” enabled with applications
- “Data Consumers” struggle with
 - Stale data → Latency
 - Why? → Context
 - Data access → Visibility



Enable Data Consumption

- “Data Consumers” enablement
- Application Integration
- EAI and Middleware
- Reporting and Dashboards
- Mixed Results
 - Latency Improved, but
 - Data Quality → Context
 - Integration Complexity → Visibility

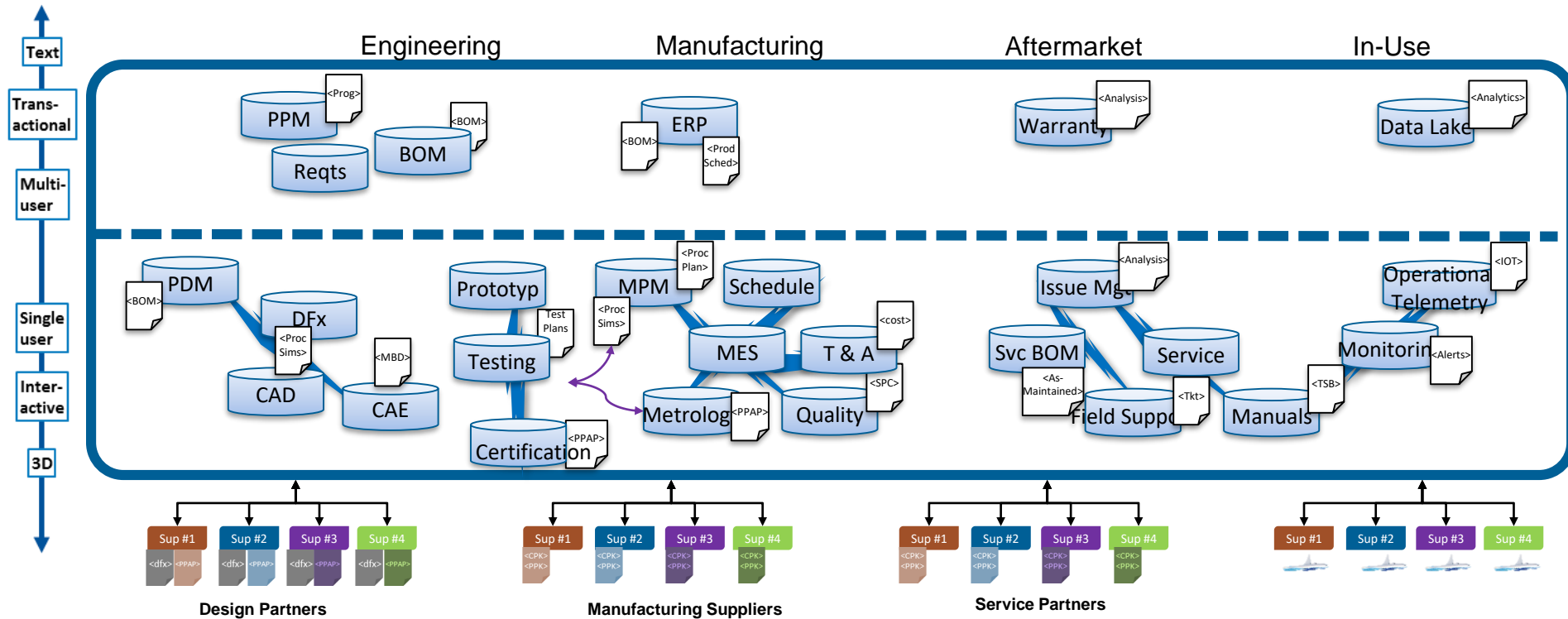


Data → Information → Knowledge

- Synthesize data to information
- Collection
- Aggregation
- Normalization
- Assign Context for global understanding
- Increase availability to ‘Consumers’
- Reduce latency
- Increase data transparency (visibility)

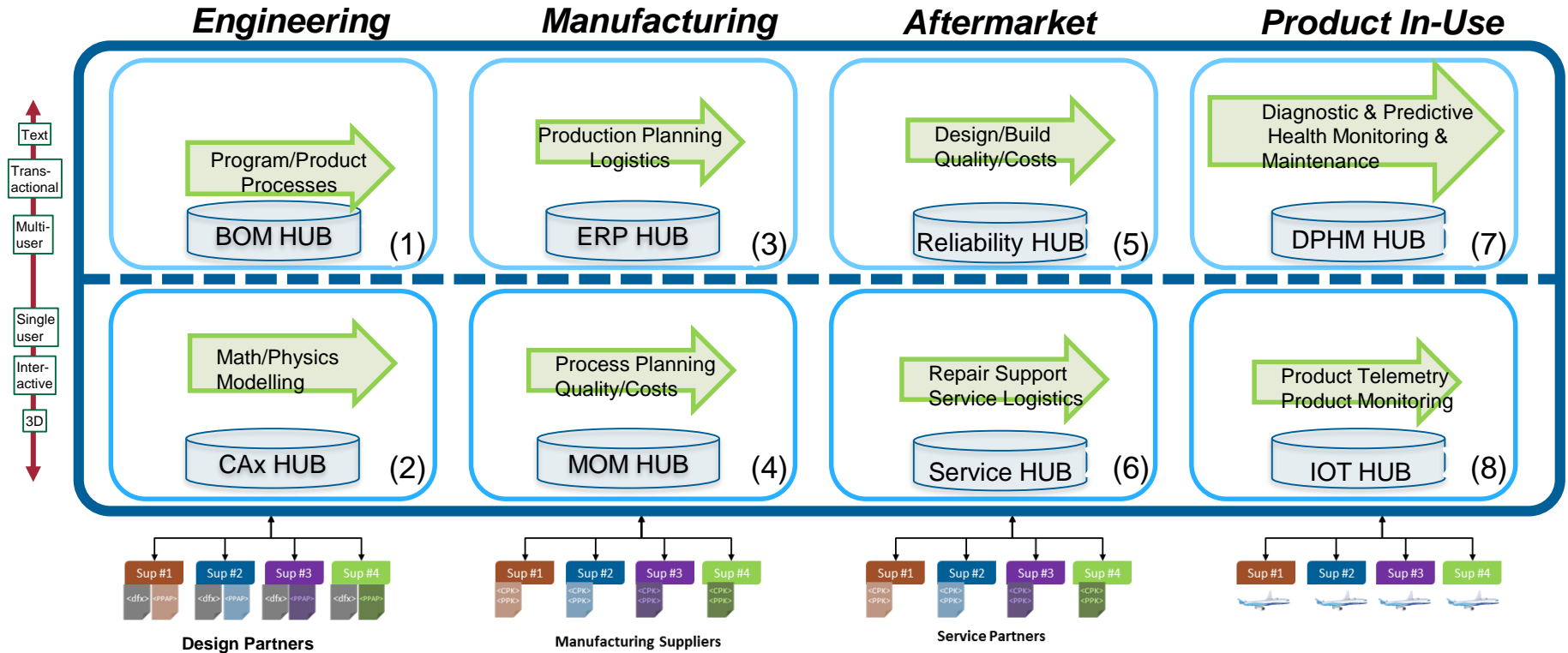
Corporate Ecosystem Application Footprint → Macro Semantic view

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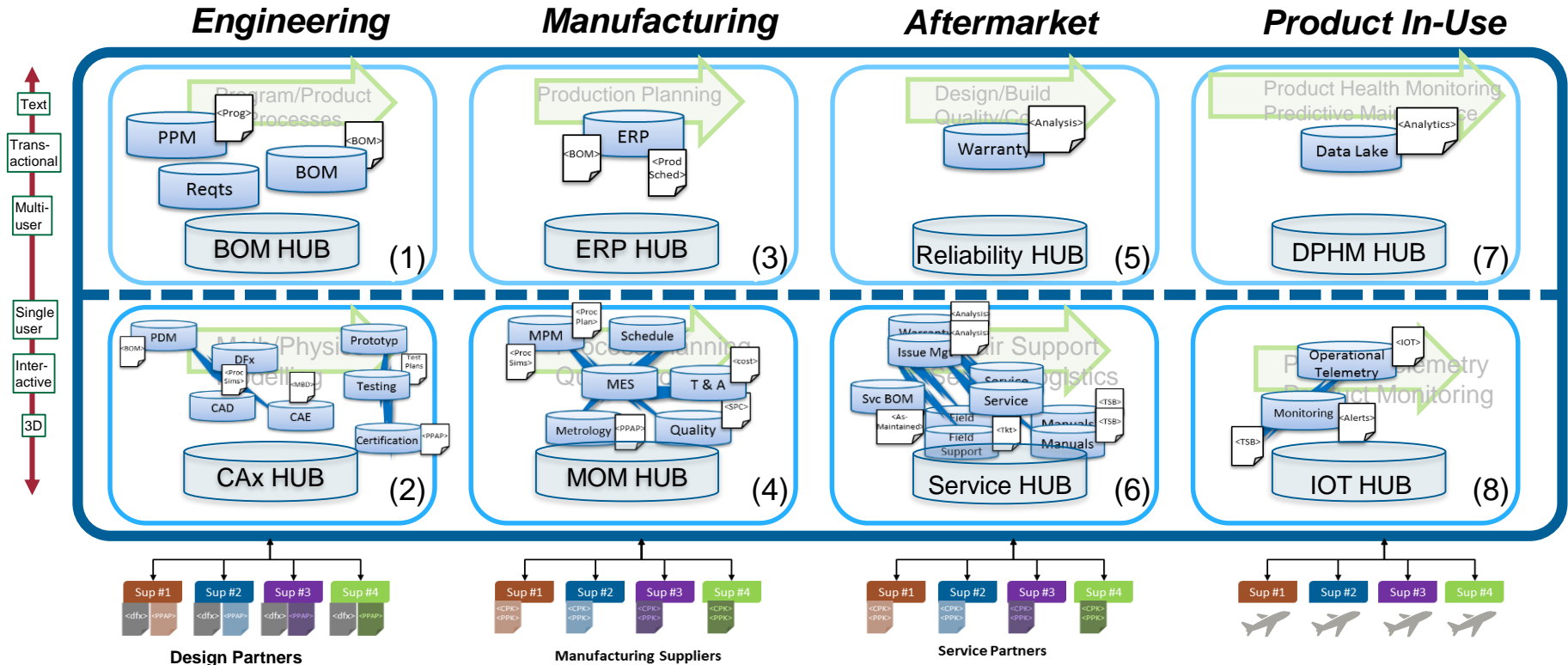
Corporate Ecosystem application footprint → Micro Semantic view

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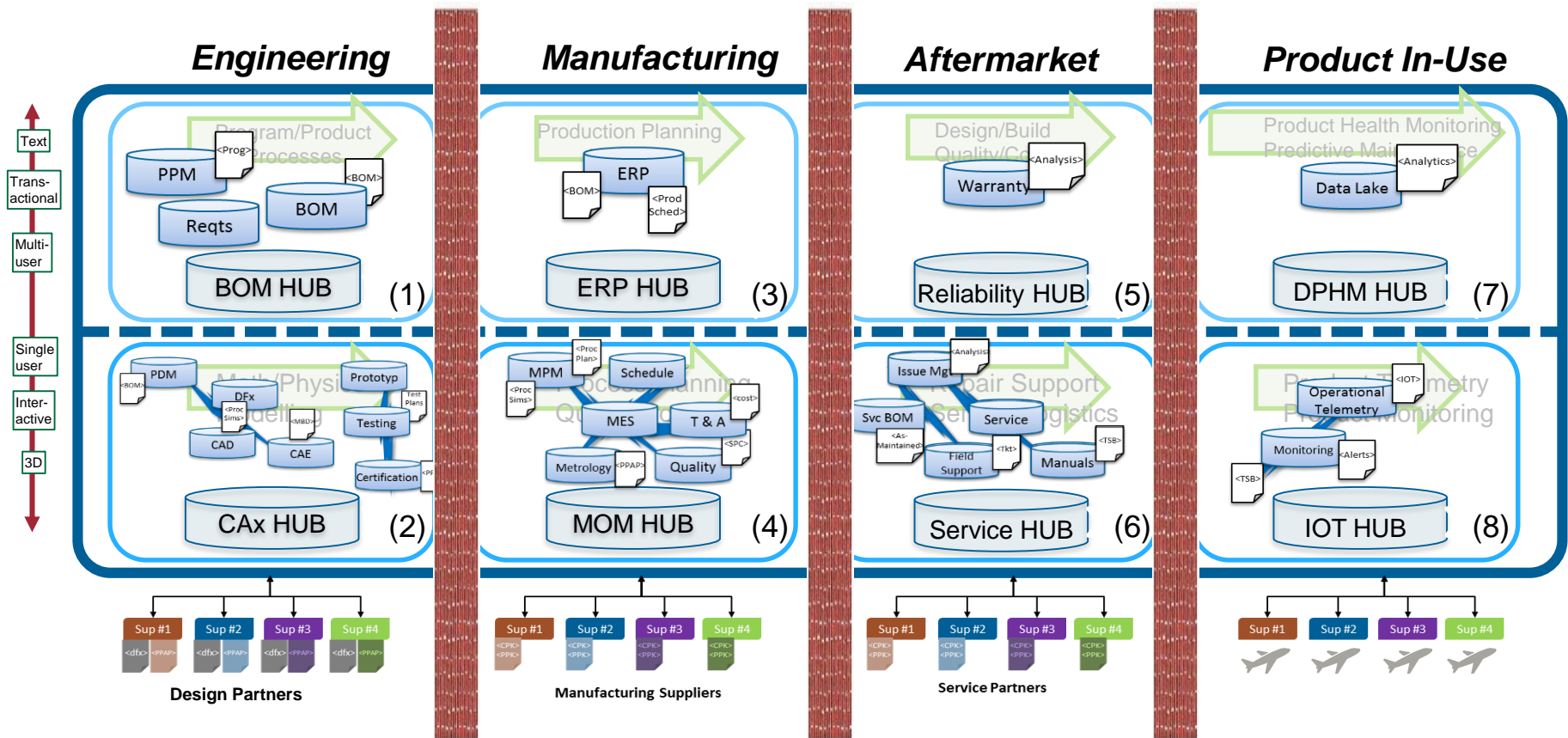
Corporate Ecosystem application footprint → Micro Semantic view

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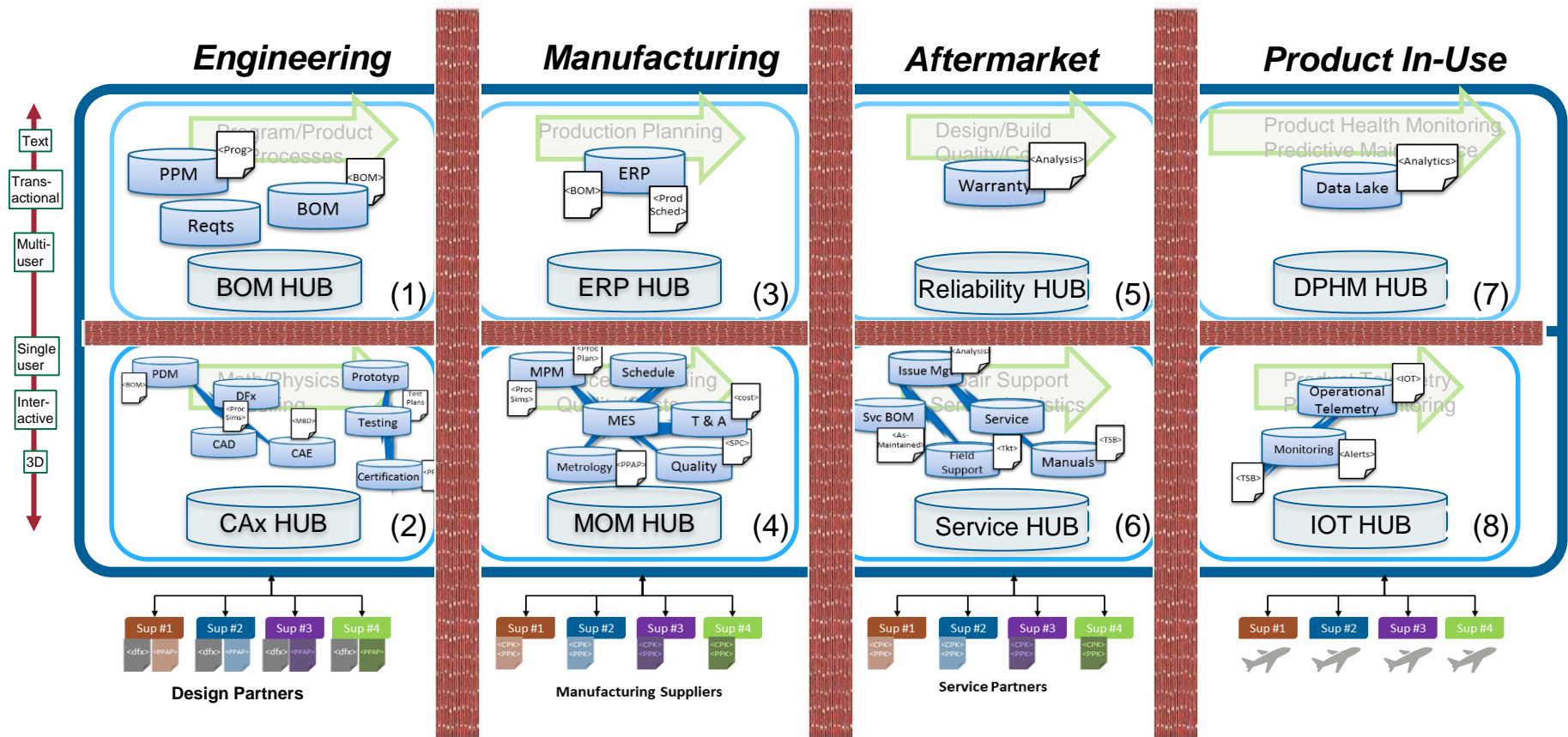
Corporate Ecosystem → Silos

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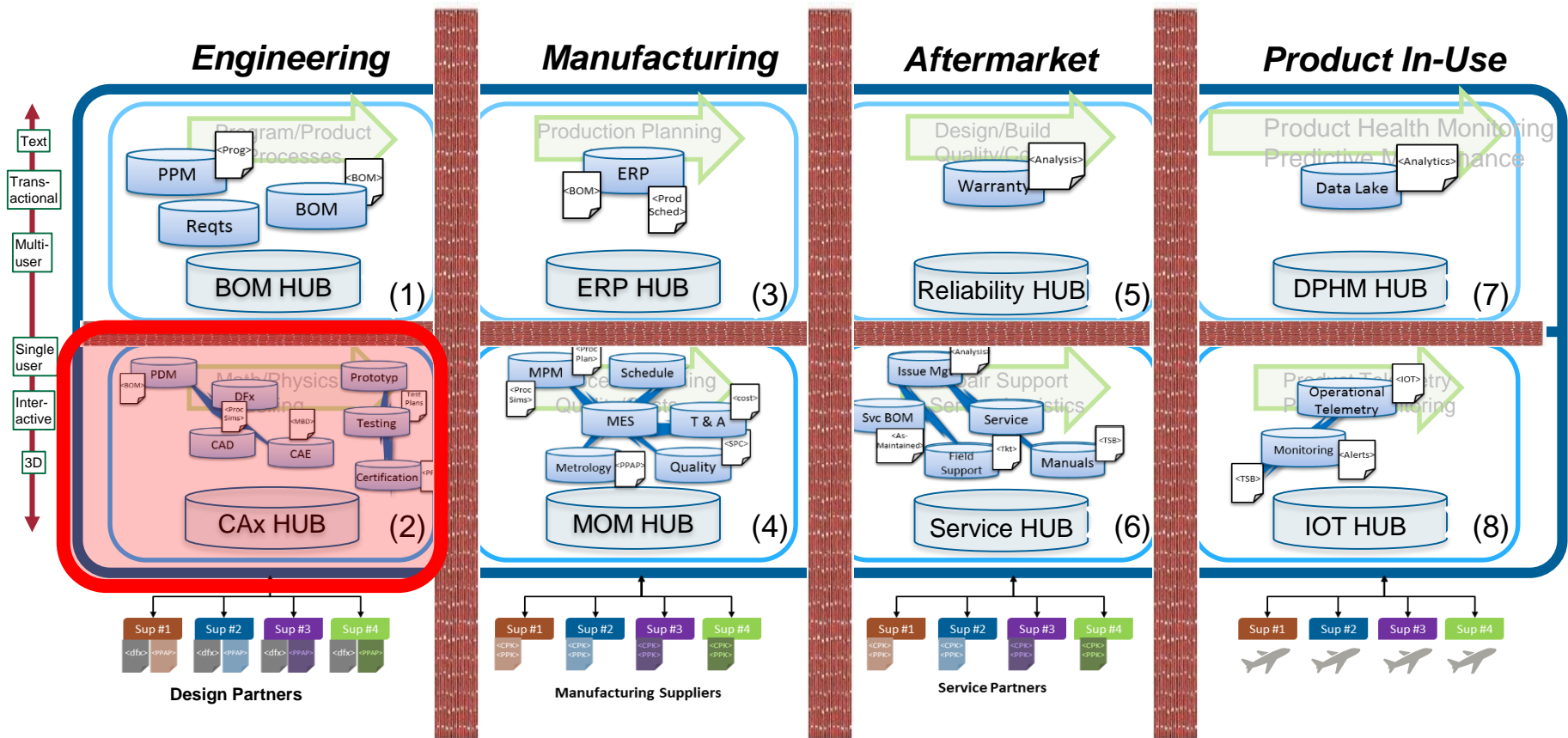
Corporate Ecosystem → Silos → Within Silos

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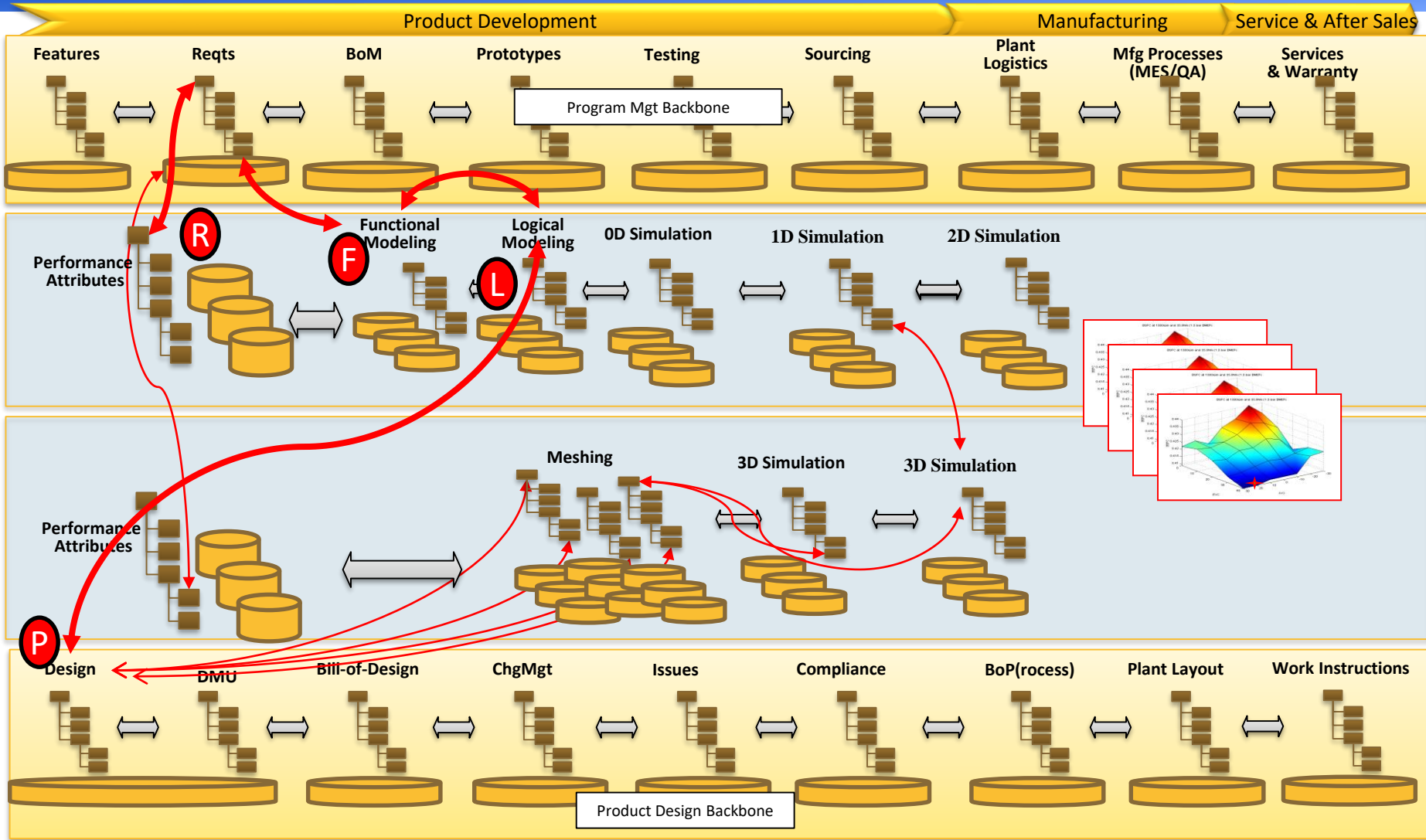
Corporate Ecosystem → “The Engineer’s Sweet Spot!”

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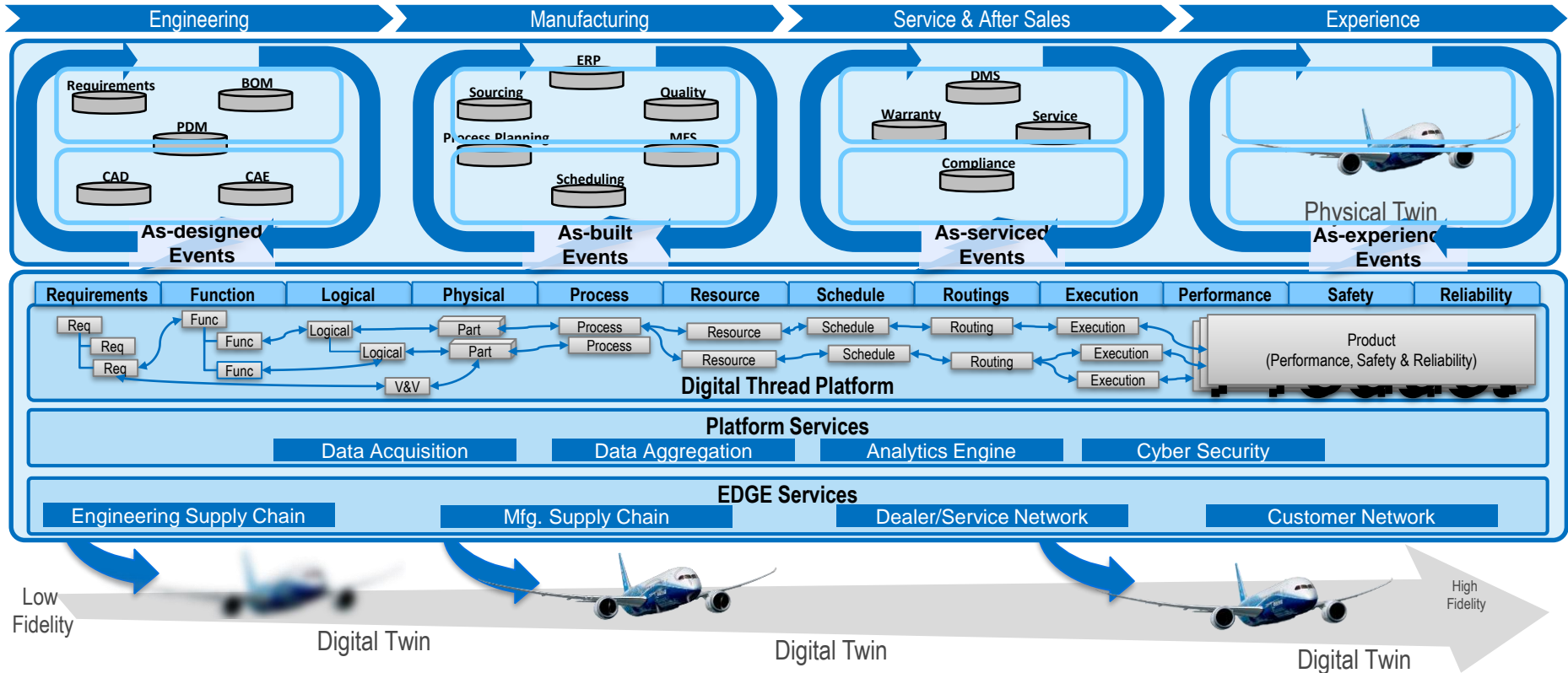
High Semantics = Low Formalization

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Enabling the Model Based Enterprise → Digital Thread

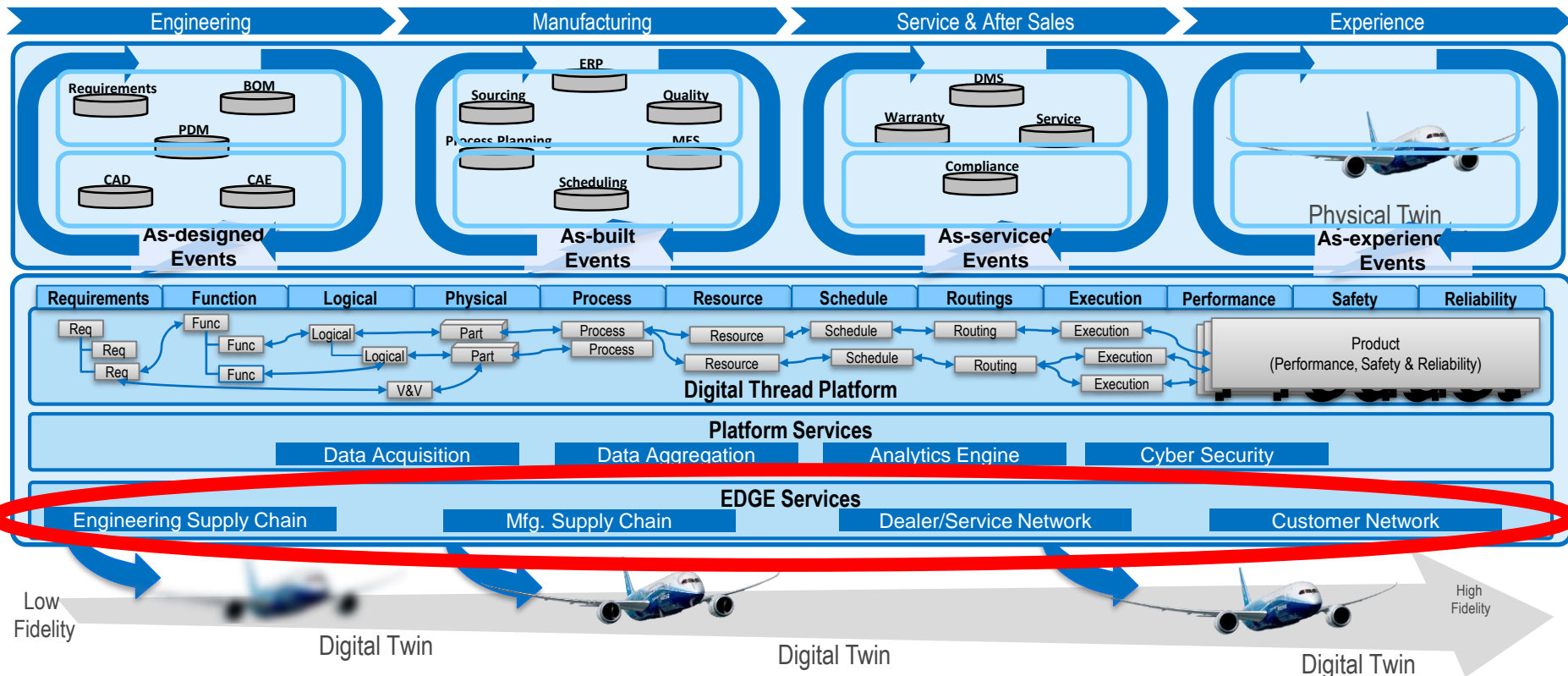
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Enabling the Model Based Enterprise → Digital Thread

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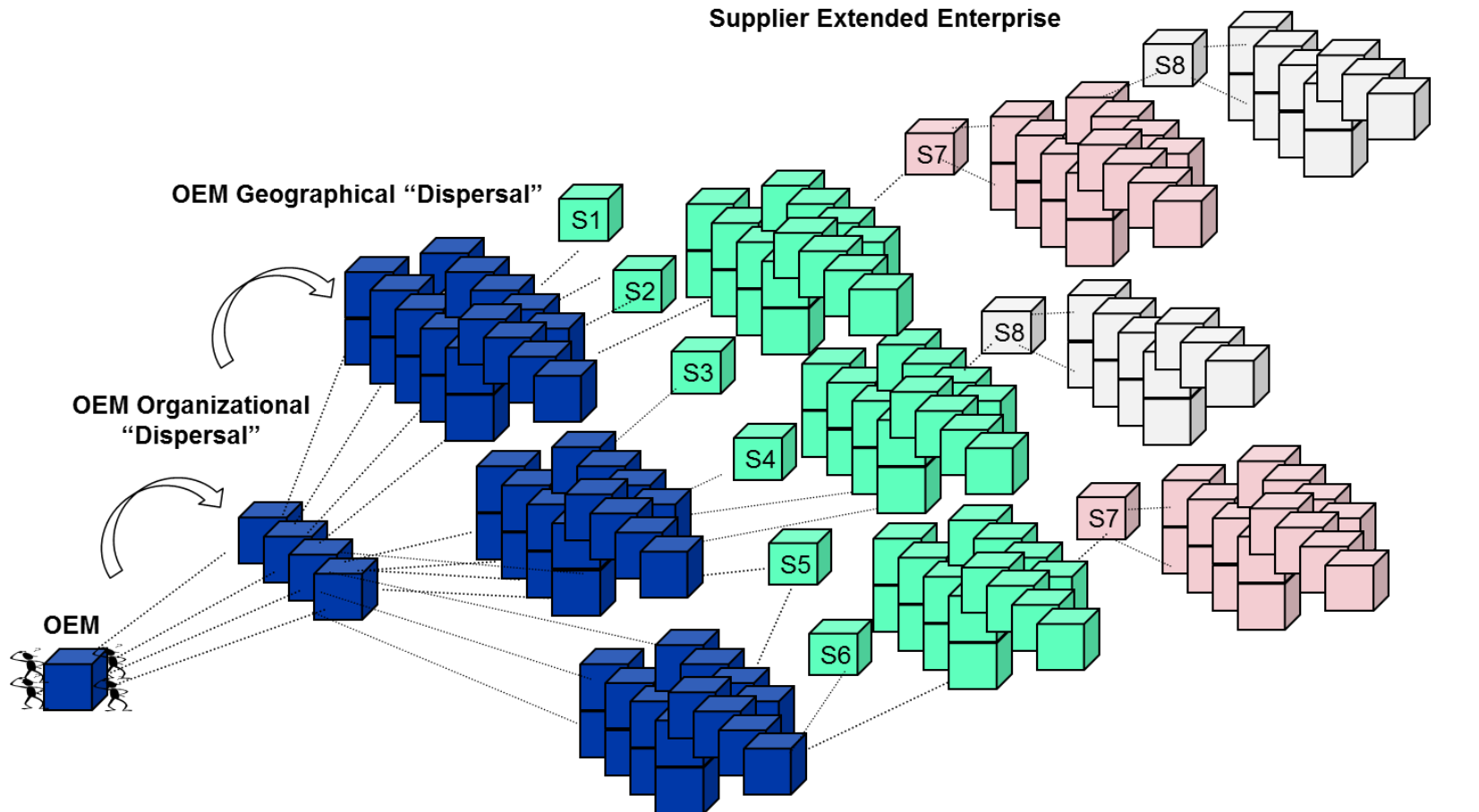
- *Breaking Down the Brick Walls between Domains*



- *But What About the Supply Chain?*

Supply Chain Growth... and Effects

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- 100% Collaboration
- 0% Latency (min's)
- 100% In-Context

- < 100% Collaboration
- > 0% Latency (hours)
- < 100% In-Context

- << 100% Collaboration
- >> 0% Latency (Days/Wks)
- << 100% In-Context

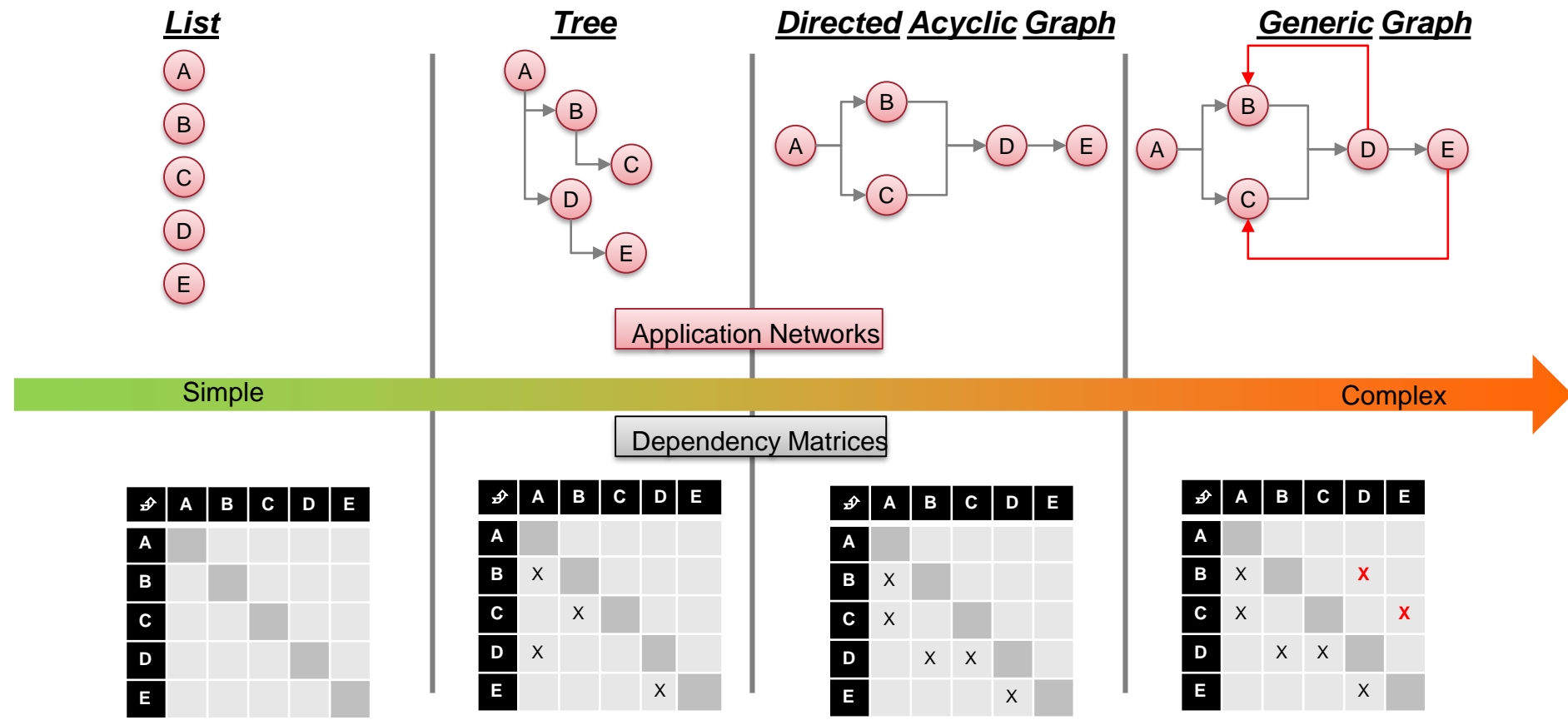
- <<<< 100% Collaboration
- >>>> 0% Latency (Months)
- <<<< 100% In-Context

1900

2000

Supply Chain Relationship Models

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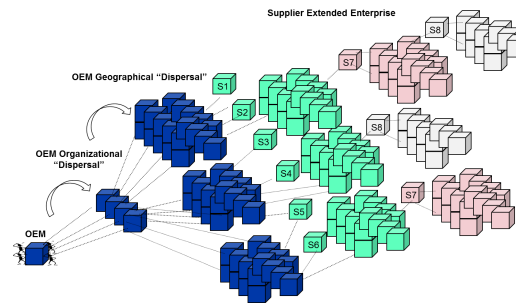


- *Cyclic dependencies in the Supply Chain introduce complexity.*
- *Increasing complexity increases impact (spread, risk, unpredictability and cost).*

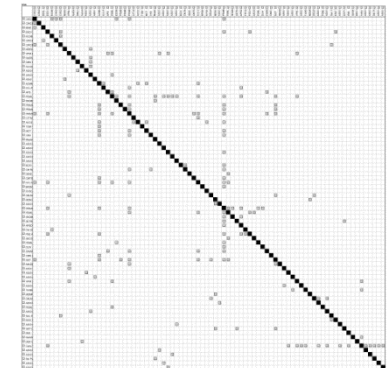
Supply Chain Modeling

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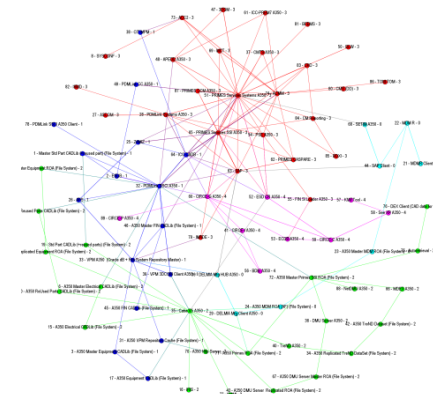
- Supply Chain is analyzed for dependencies and modularity
- Dependency Matrices defined
- Sensitivity Cluster Map built



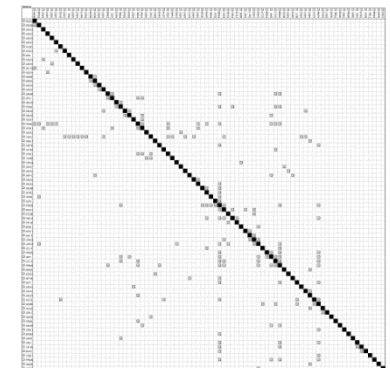
Supply Chain



Dependency Matrix



Supplier Clusters

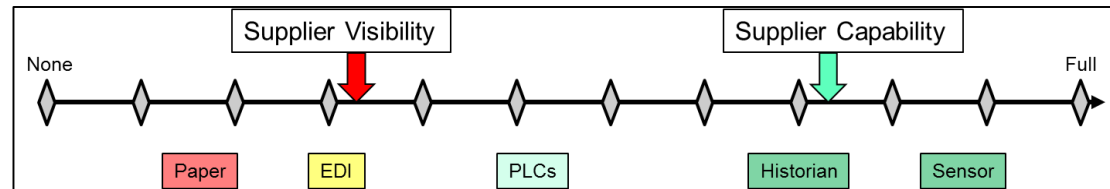
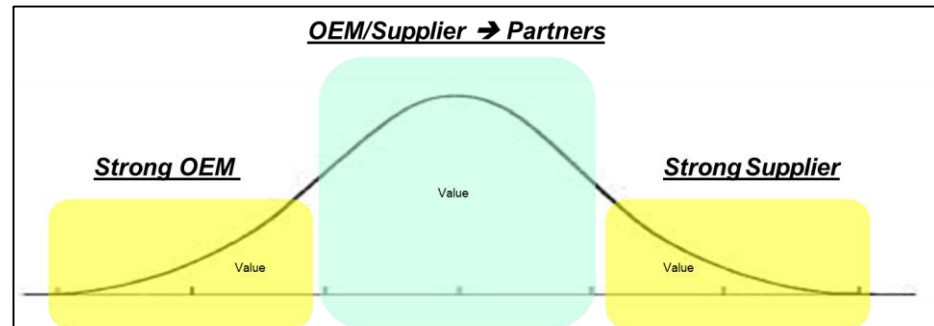
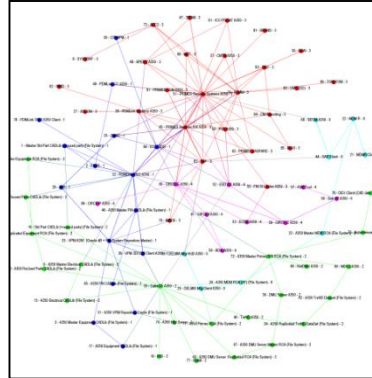


Dependency Matrix(Normalized)

System Dynamics Modeling for Supply Chain

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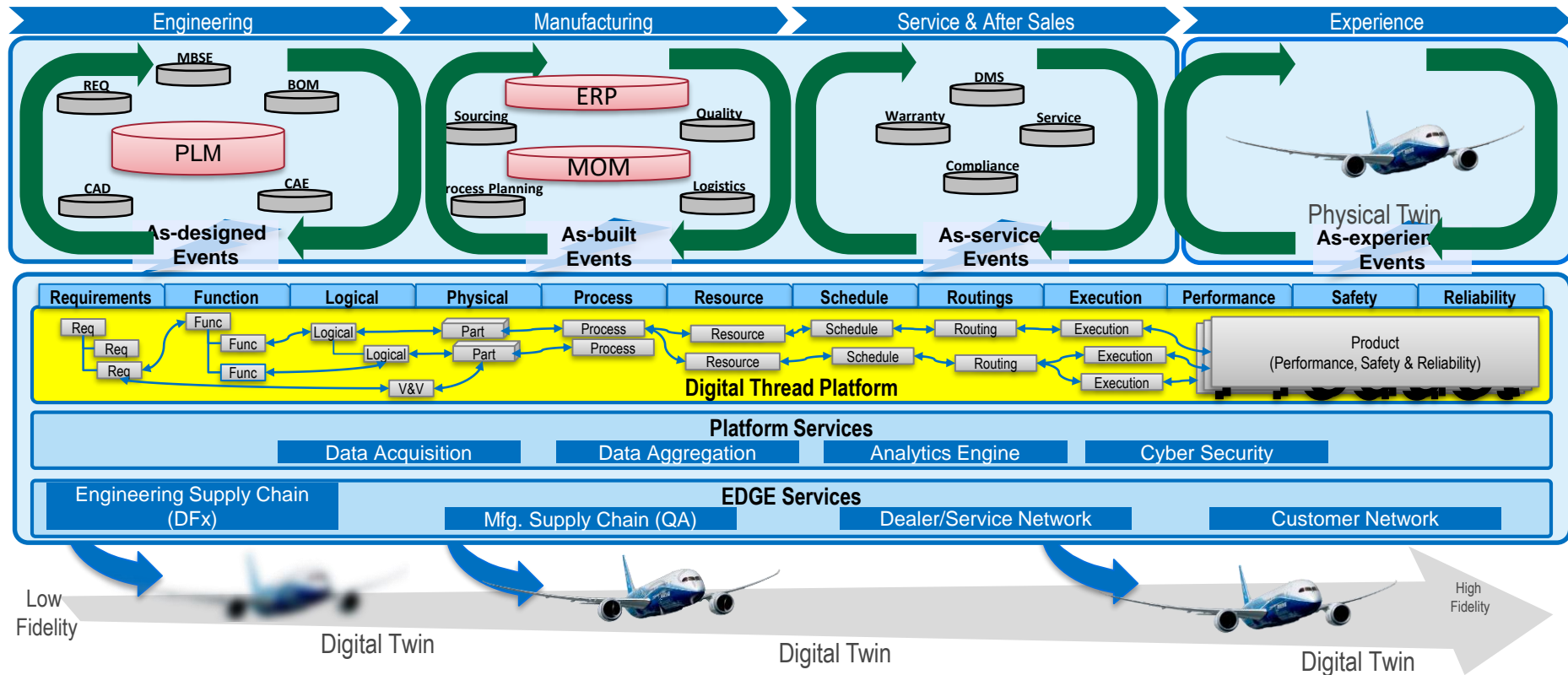
- *Supply Chain Models are difficult*
 - “moving target”
 - Immature capabilities
- *Requires Partnership Relationship*
- *Requires Transparency & Visibility*



The Way Forward...

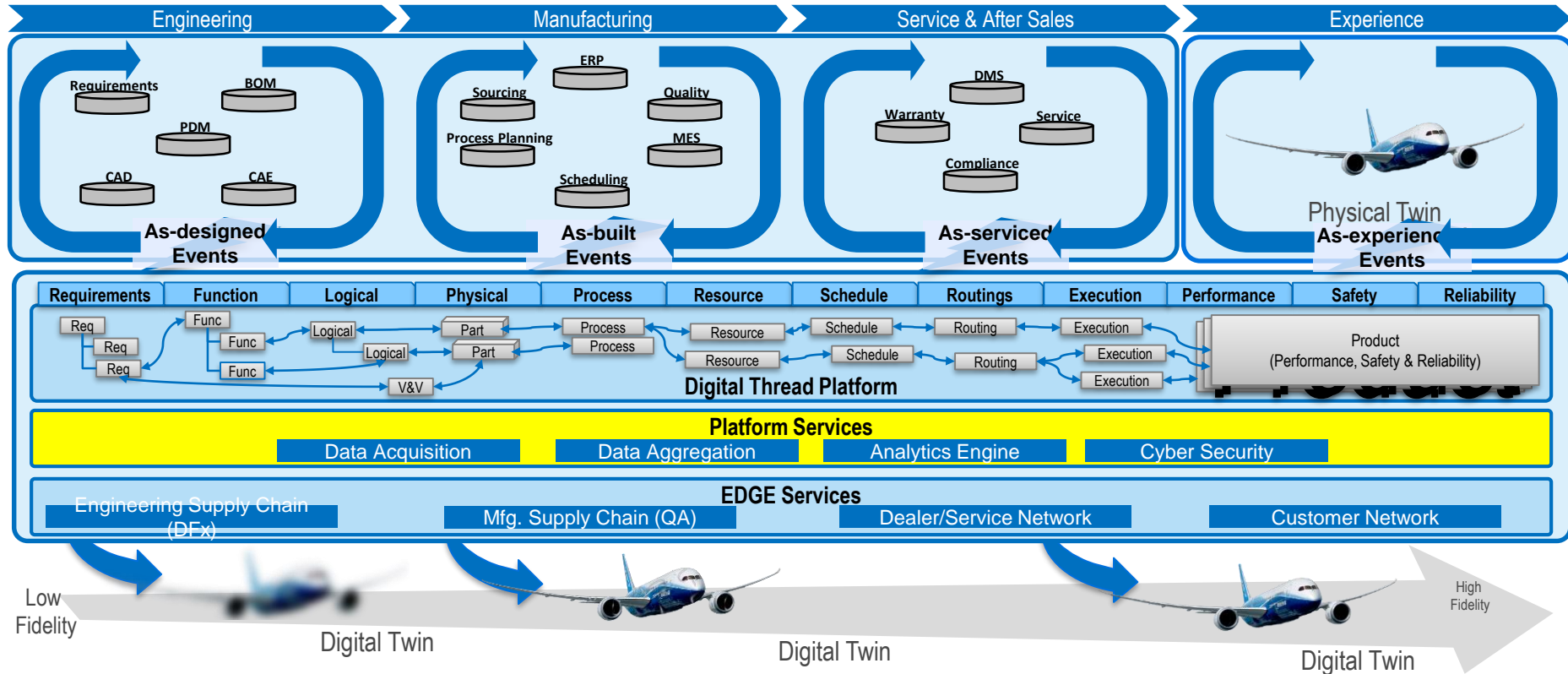
Enabling the Model Based Enterprise requires Building Digital Thread

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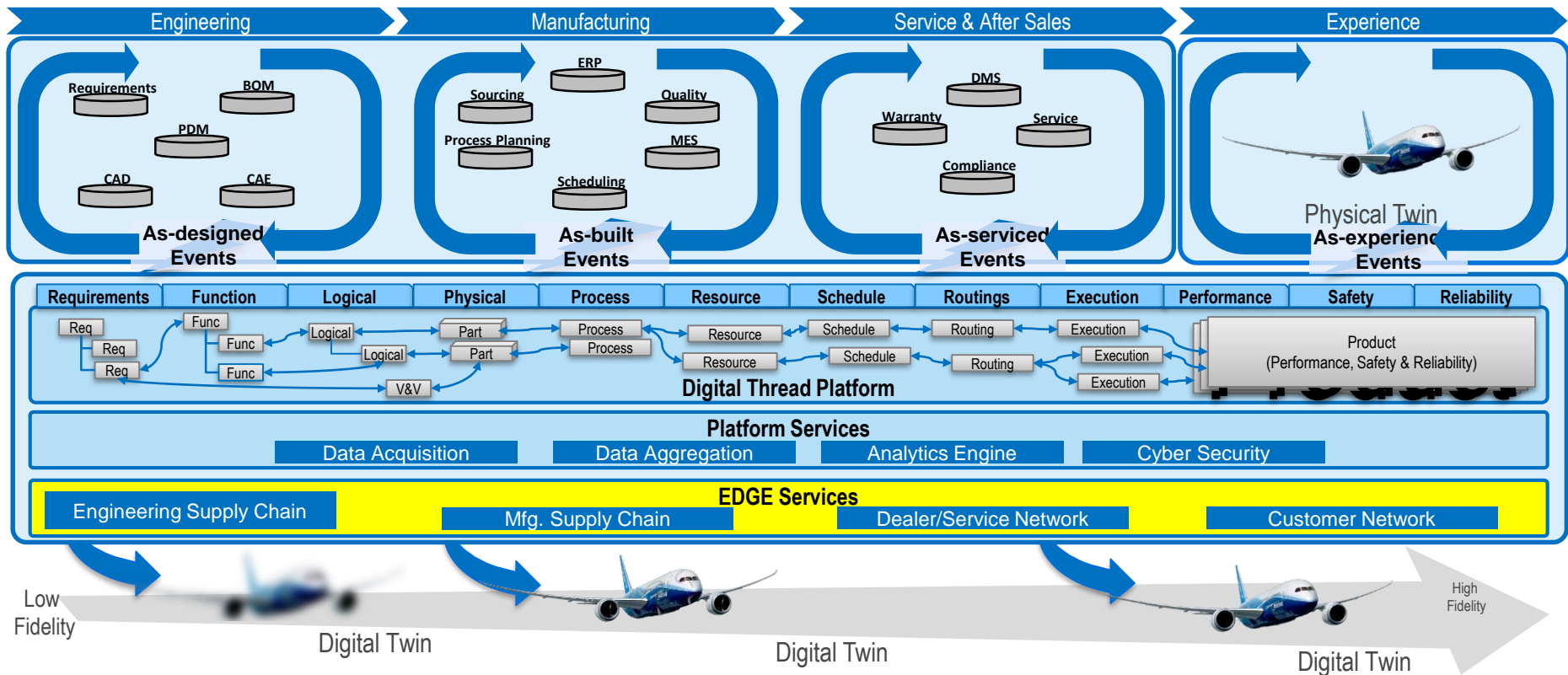
Enabling the Model Based Enterprise requires Platform Services

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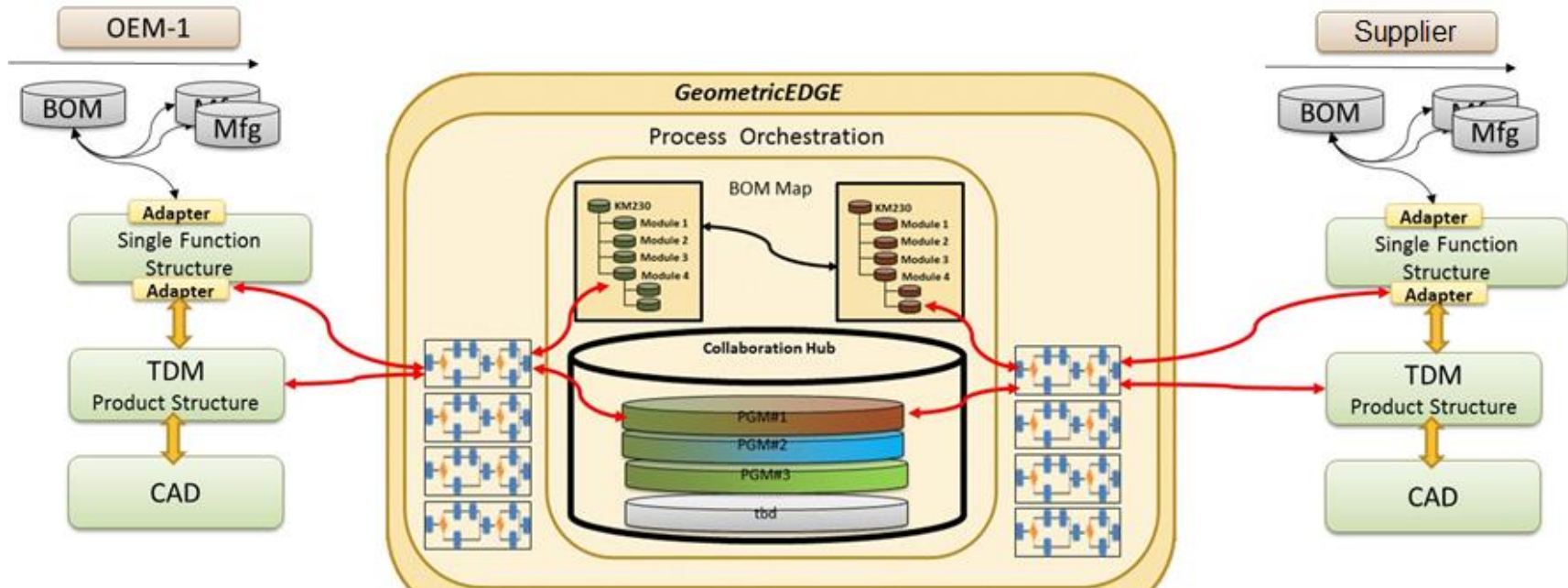
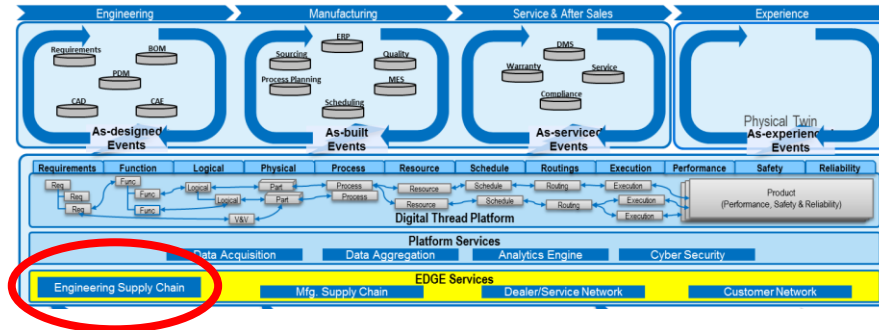
Enabling the Model Based Enterprise requires EDGE Services

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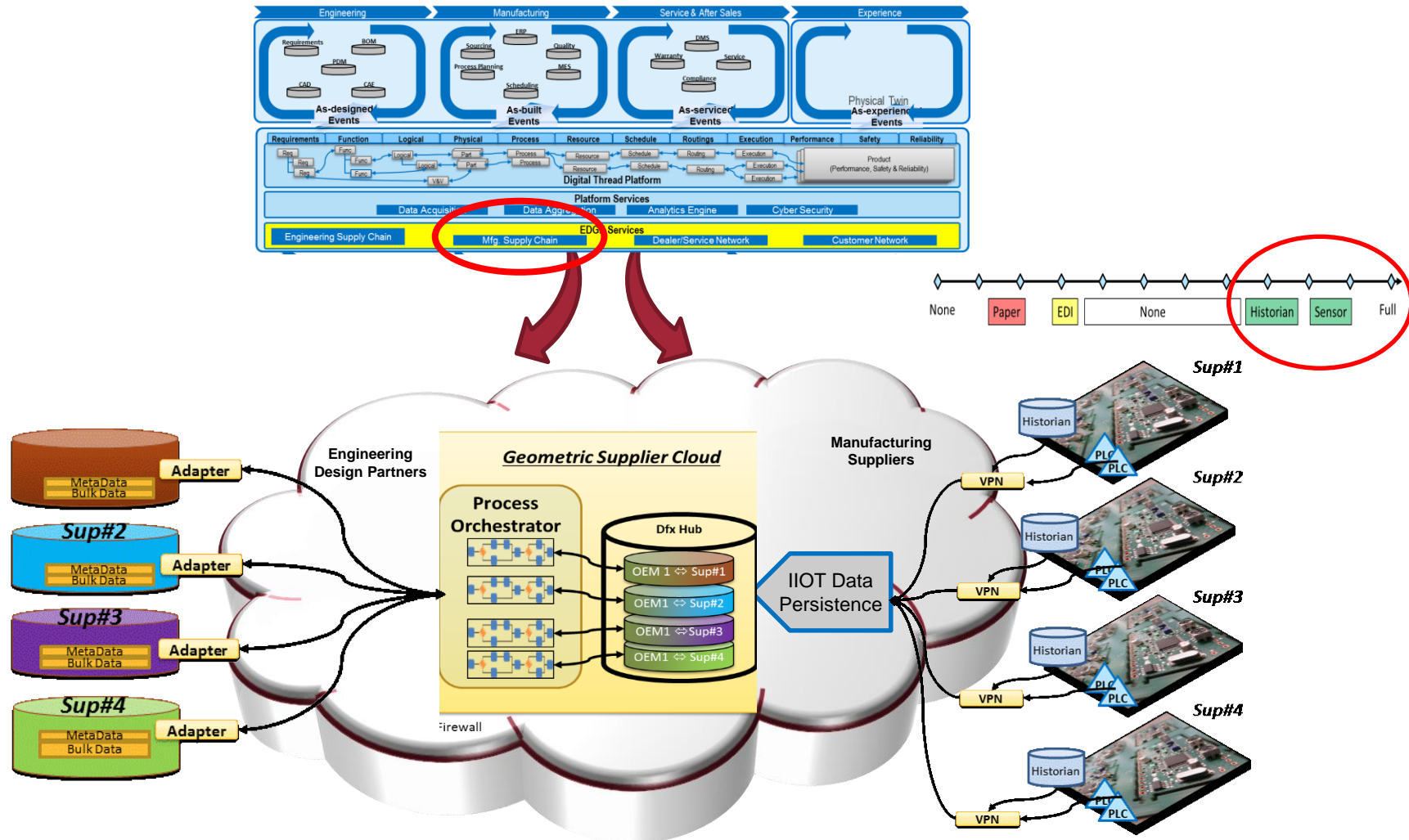
Enabling the Model Based Enterprise requires EDGE Services

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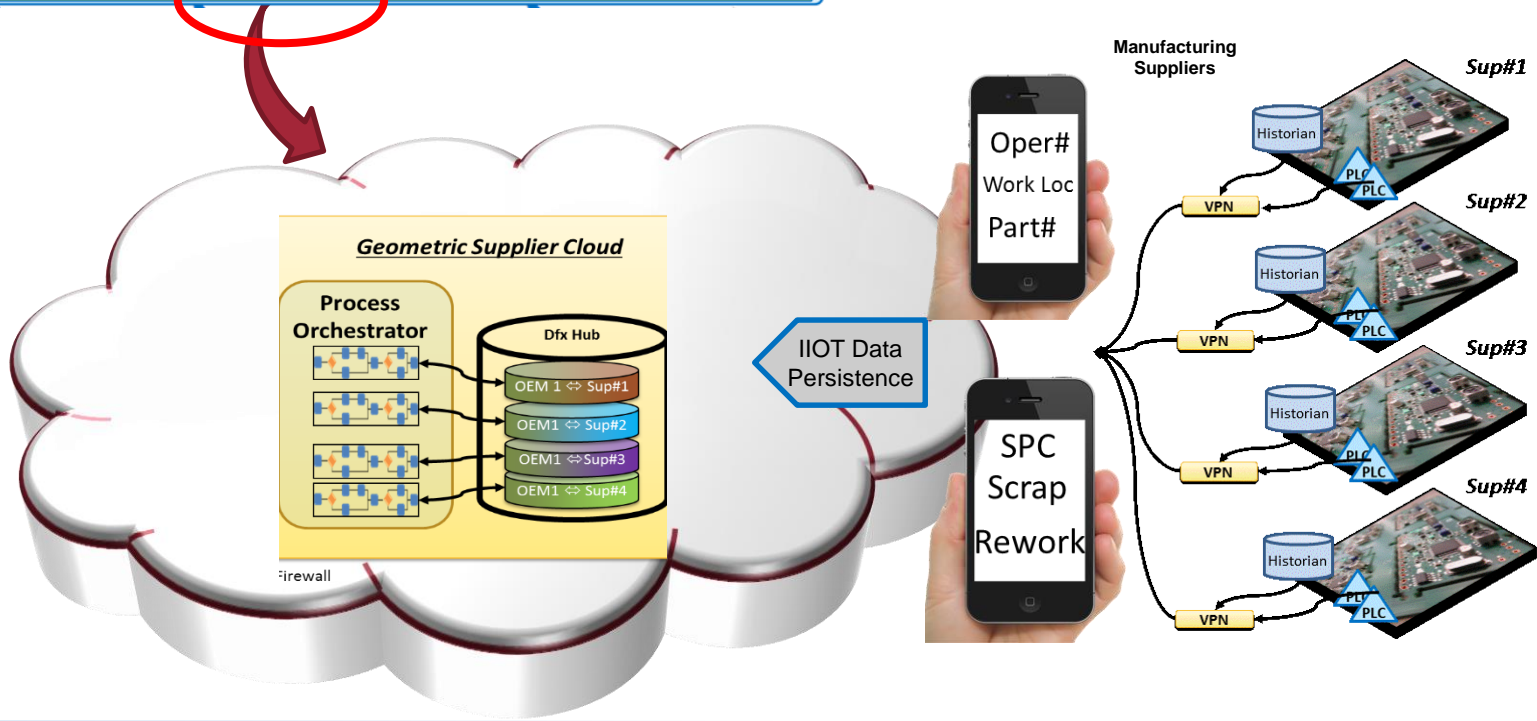
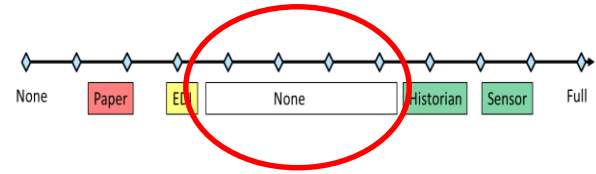
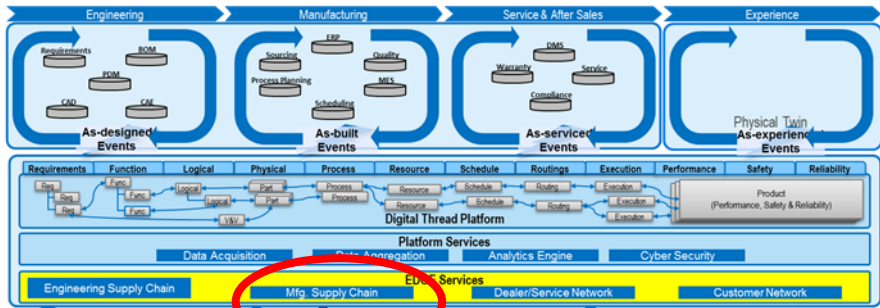
Managed Visibility From Supplier Chain via Cloud Based Data, Process, & Logistics Sharing

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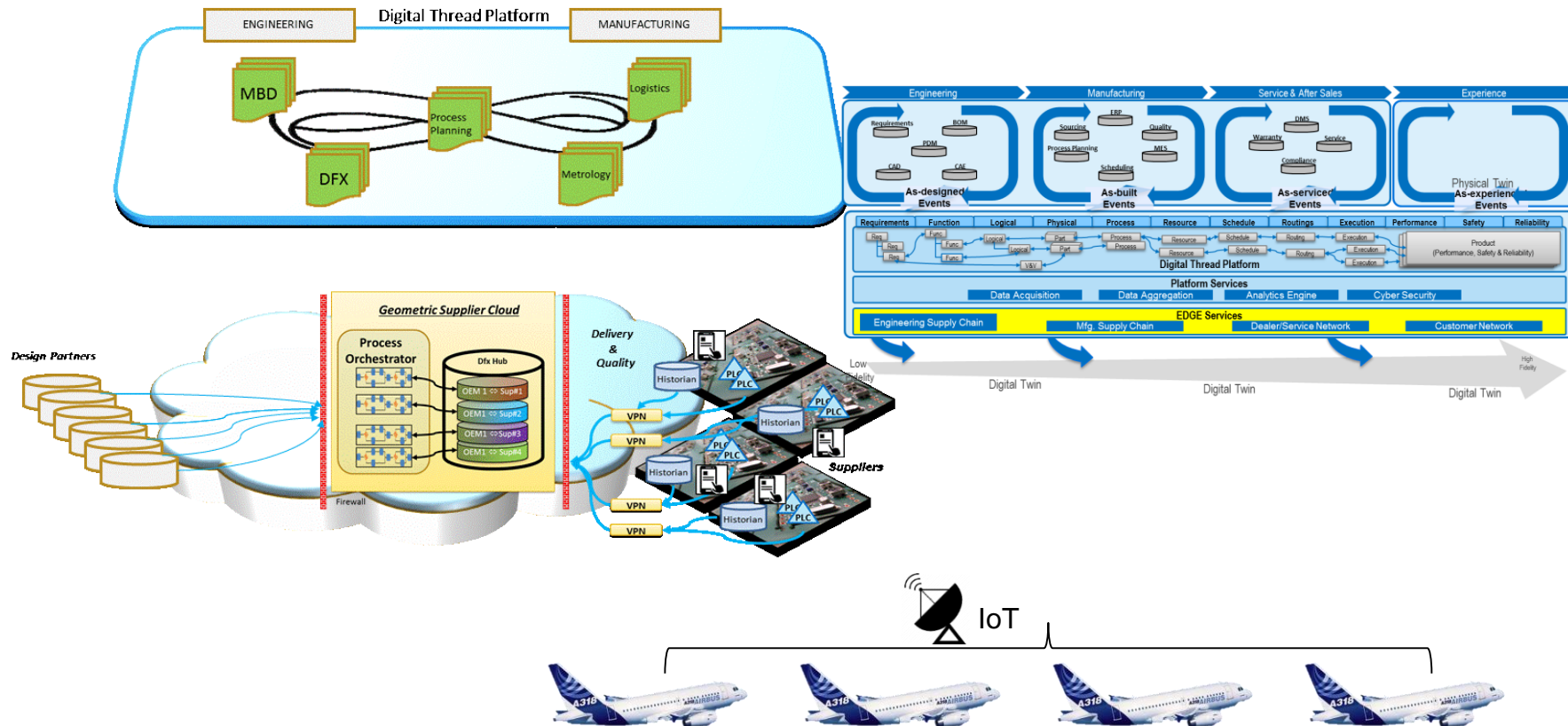
Managed Visibility From Supplier Chain via Cloud Based Data, Process, & Logistics Sharing

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What can be done today.... example



Digital Thread Consumption.....

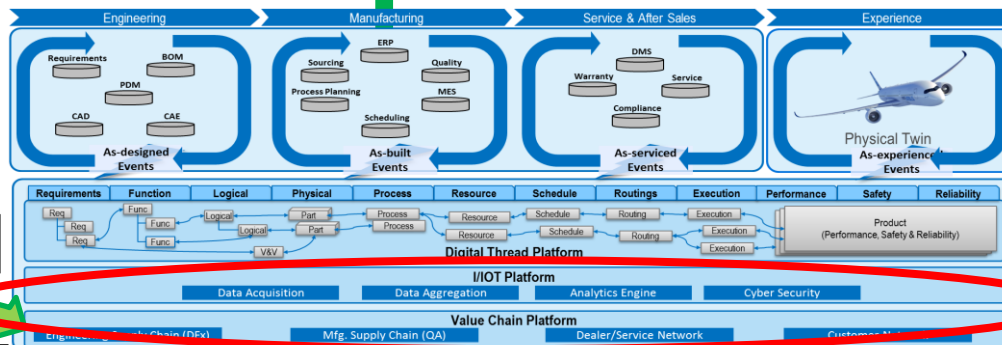
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Predictive Models

- Statistical Methodologies
- Sparse data sets
- Massive variability/correlations



Context



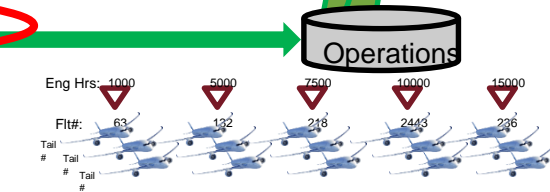
Trends/Patterns

Rules/Std



Explanatory Models

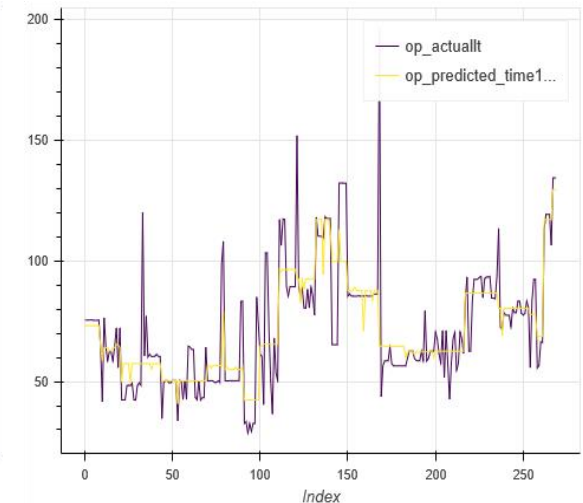
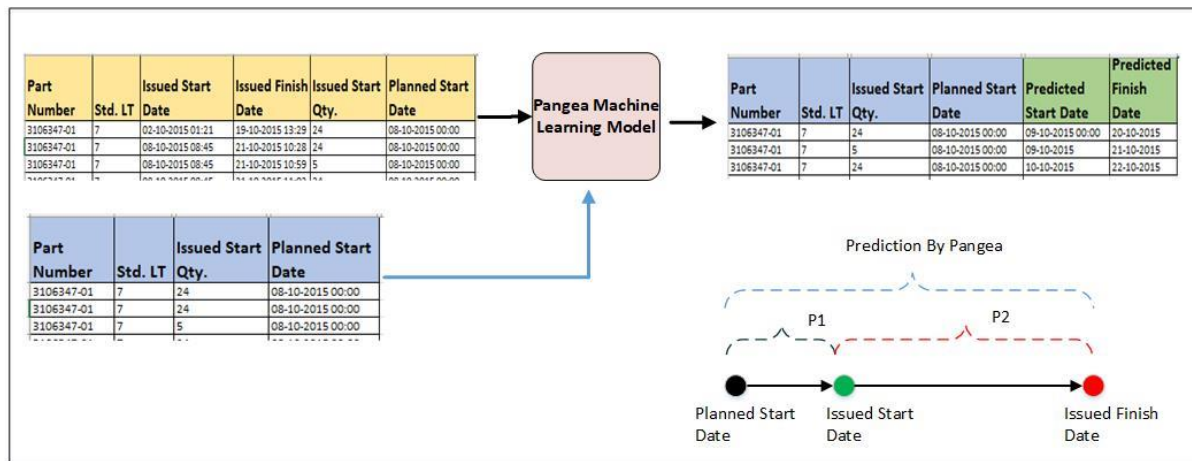
- Enabling prescriptive analysis



Delivery Date Prediction using Historical Data

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Customers would like to see how Analytics / Machine Learning technologies can be used on Supplier's historical data (Completed Work Orders) to predict Finish Date for a Planned / WIP Work Order. This would help in better planning of risk mitigation & improve customer satisfaction.

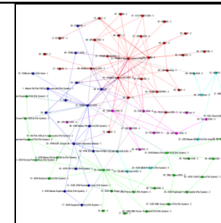


• Today's Solutions to Stabilize the Supply Chain....

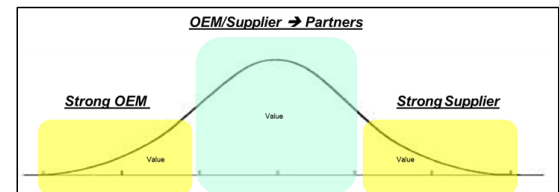
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- *Analyze Supplier History*
 - *Delivery Transactions*
 - *Delivery Timing & Quality*
 - *If Good → keep the Supplier*
 - *If Bad → keep the Supplier*
- *“trust, but Verify!”*
 - *Link Suppliers to Digital Thread*
 - *Build Visibility Portals & Links*
- *Provide a Win-Win Partnership*

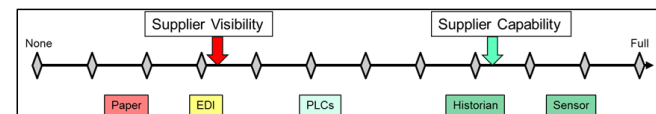
- *Supply Chain Models are difficult*
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- *Requires Partnership Relationship*



- *Requires Transparency & Visibility*



Thank You.....