DocWeb + DocGen + TeamWork + MagicDraw

MBSE with Doctimus Prime

Transforming system models into documents

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Agenda

- Why is it valuable?
- Who does it help?
- What is it exactly?
- How mature is it?

Context

Team's **systems engineers** are **modelers**

Engineering work is done in **models**

Deliverables are in the form of **documents**

Team's **stakeholders** are **not modelers**

Context

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↓

Gap

↑

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Engineering work is done in **models**

Software transforms **models** into **documents**

Stakeholders use web to **collaborate**

Deliverables are in the form of **documents**

Team's **stakeholders** are **not modelers**

Value Proposition

Use engineering work directly in documentation

- Reduce cost & time by preventing duplication of work (**leverage MBSE effort**)
- Reduce cost & time by using sophisticated automation
- Reduce risk by **preventing inconsistencies**

Share documents in collaborative web application

- Reduce cost & time by **making information easily accessible**
- Reduce risk by enabling better collaboration

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Value Proposition

More time can be invested in technical work

Bonus

- Products can be higher quality
  - Example: EHM wants to do statistical resource analysis that wouldn't have fit in schedule
- Managers can pay engineers to do engineering work,
- Engineers can be happier and smarter
  - Higher quality work products
  - Better professional development
  - Better personnel retention

Case Studies

EHM - MEL

Europa Habitability Mission - Master Equipment List

- Subsystem engineers use DocWeb as **the reference for mass reports**
- Material generated by this system will be embedded in **final study report**

> "DocGen and DocWeb have been **fundamental enablers** for the progress we've made on applying MBSE to the Europa Studies."
> "It is a **critical capability** for Europa…"

Value: "DocGen and DocWeb have been fundamental enablers for the progress we've made on applying MBSE to the Europa Studies. They provided us with an essentially free solution to what had been a significant risk, which was how to allow the rest of the project to interact productively with the SysML models. This is most true of the management stakeholders who need to see the current state of the concept when they ask for it. In the past we have had to manually update Powerpoint, Word and Excel packages to satisfy these requests – a very time-consuming and error-prone process. Now we simply give them the URL of the latest model report on DocWeb. It is not exaggerating to say that the web-accessible reports provided by DocGen and DocWeb, including the SysML block diagrams and the Master Equipment Lists, have played a key role in the success of MBSE on Europa."

Impact if Unavailable: "It is a critical capability for Europa, so if it were no longer available through MGSS OpsRev we would have to take it over and maintain it with our own funding. "

- Todd Bayer

Case Studies

Ops Rev - First Review

- Initial DocGen was created by systems engineer with < 0.25 FTE allocation
- Tool investment paid for itself by the first review
  - Generated **full documentation and review products**
  - Turned around changes in < 24 hours from one day of review to the next day
  - Review was very well received

Case Studies

Ops Rev - Delivering the First MOS Service

- Developed 10 substantial documents within a month of elapsed time
  - 3-4 FTEs allocated for that month doing systems engineering
  - ~1 FTE allocated to developing frameworks, tooling, and patterns during that month
  - **Saved about 5 work-months of effort** in one calendar month
  - With conventional methodology, documents would have been inconsistent

Case Studies

Ops Rev - Remaining MOS Services

- Identified patterns in the first service's documents
- Refined our methodology
- Automated generation of model & document skeletons for remaining services
- Spent one week with 2 FTE allocation
- **Saved 16 work-months** of tedious effort

Testimonials

Team X

"DocGen / DocWeb is an **enabling technology** for enterprise-level model-based systems engineering ..."

"**Gained efficiencies** for Team X would be ~10-20 hours per study ..."

"DocGen / DocWeb is an enabling technology for enterprise-level model-based systems engineering and a grown-up approach to knowledge management as well as engineering team agility."

"Gained efficiencies for Team X would be ~10-20 hours per study by being able to be assured of product technical consistency on generation (Deputy SE chair is currently report wrangler). Having consistent viewpoints in DocWeb 3 as an operational capability would be powerful for Explorer / Discovery / New Frontiers internal data products for major reviews (e.g., Baseline Commitment Review)."

- Bjorn Cole

Testimonials

AMMOS Catalog

[creating a Service Level Agreement] "takes one work week, with **at least a work day** dedicated to document creation. Using DocGen, the initial document that is fully populated with customer selections is **now generated in a matter of minutes**."

Value: "It has been estimated by the Commitments Engineers that creating a Service Level Agreement or a Letter of Commitment takes one work week, with at least a work day dedicated to document creation. Using DocGen, the initial document that is fully populated with customer selections is now generated in a matter of minutes. The rest of the work effort can now be focused on negotiating with customers and minor tweaks to the document. This decrease in work time has been a major positive talking point for the task."

Impact if Unavailable: "If DocGen/DocWeb were no longer available then I believe that my task would shun model based systems engineering and revert back to managing word documents and attempting to version-control excel spreadsheets. Without the reports of the model I would not have an effective way to communicate to my stakeholders the work I have done nor the benefits of completing this work in a model based manner. Having a gateway to the model where I can present the information in a form that looks like a similar document created in Word via DocGen/DocWeb provides an easy access point to the benefits of MBSE."

- Elyse Fosse

What is it?

Doctimus Prime

System for creating documents from model-based systems engineering work and making them easily accessible

MagicDraw + **TeamWork** + **DocGen** + **DocWeb**

What is it?

Doctimus Prime

System for creating documents from model-based systems engineering work and making them easily accessible

MagicDraw - desktop tool for editing system models

TeamWork - repository for storing system models

DocGen - MagicDraw plugin for generating documents

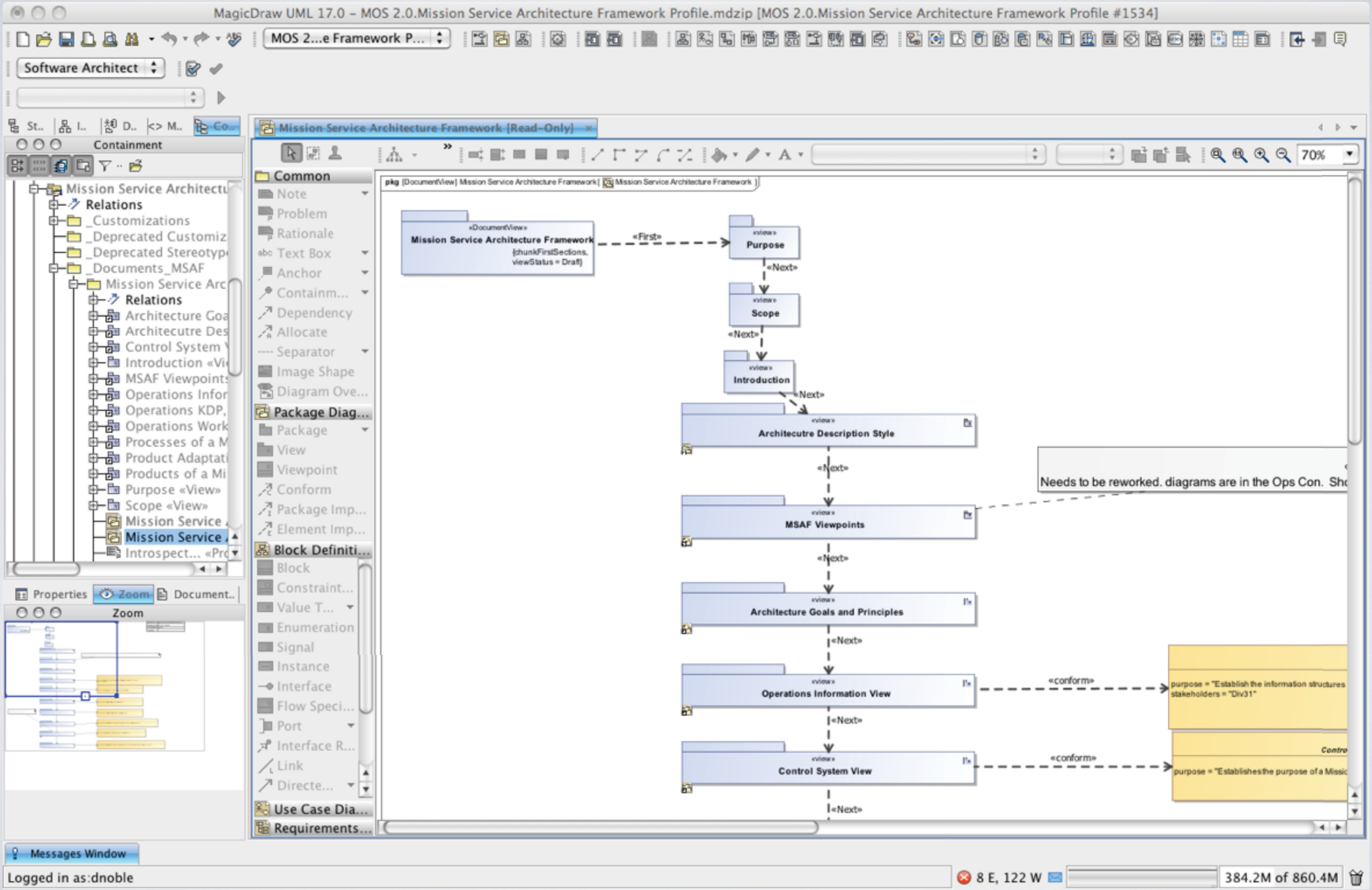
DocWeb - web application for managing documents

How does it work?

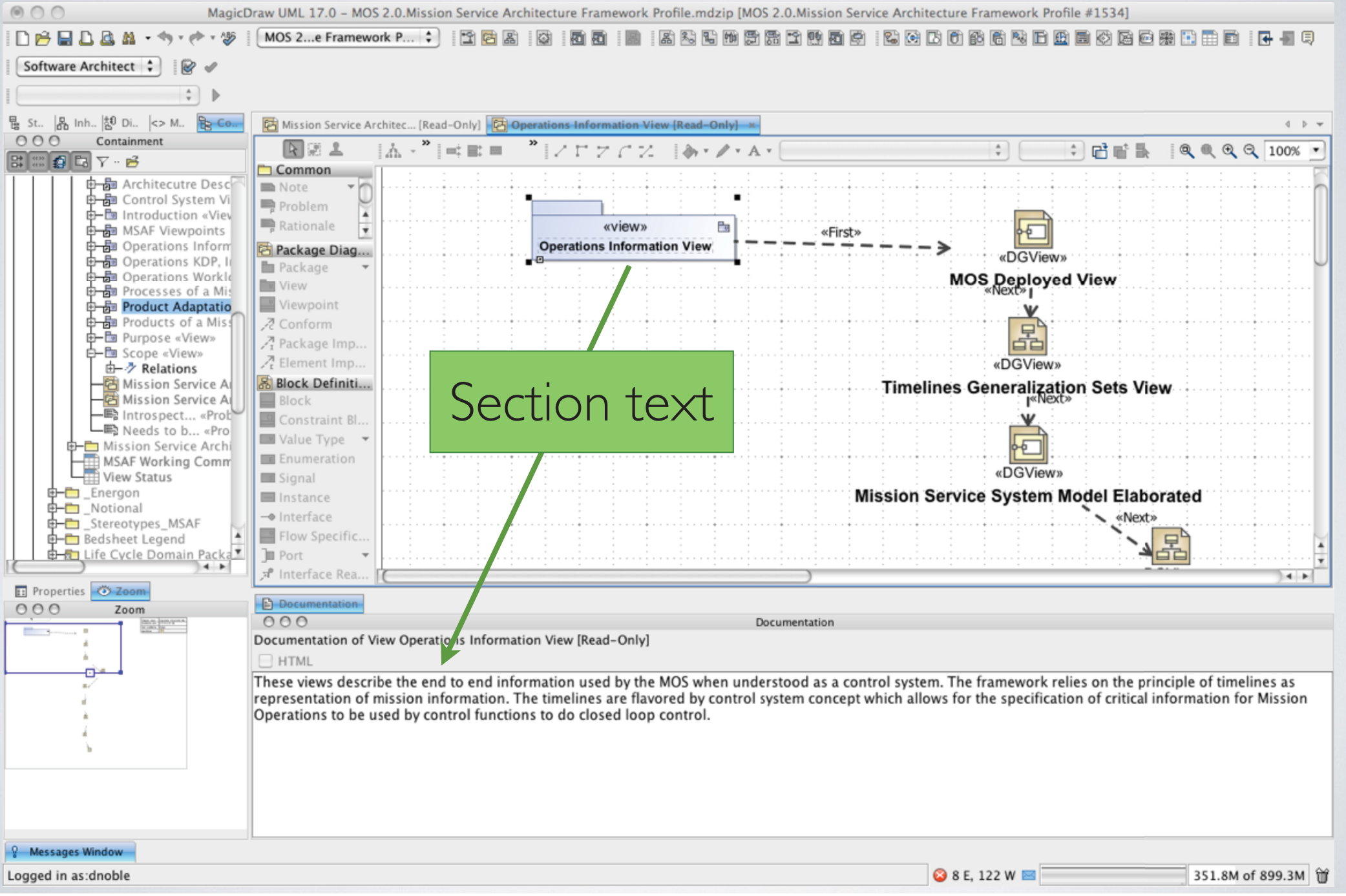
Create system models Create document models	MagicDraw + DocGen
Store models centrally	TeamWork
Generate documents	DocGen
Publish documents Read HTML and PDF documents Organize documents (tag, favorite) Add comments View history	DocWeb

[Screenshots in backup material]

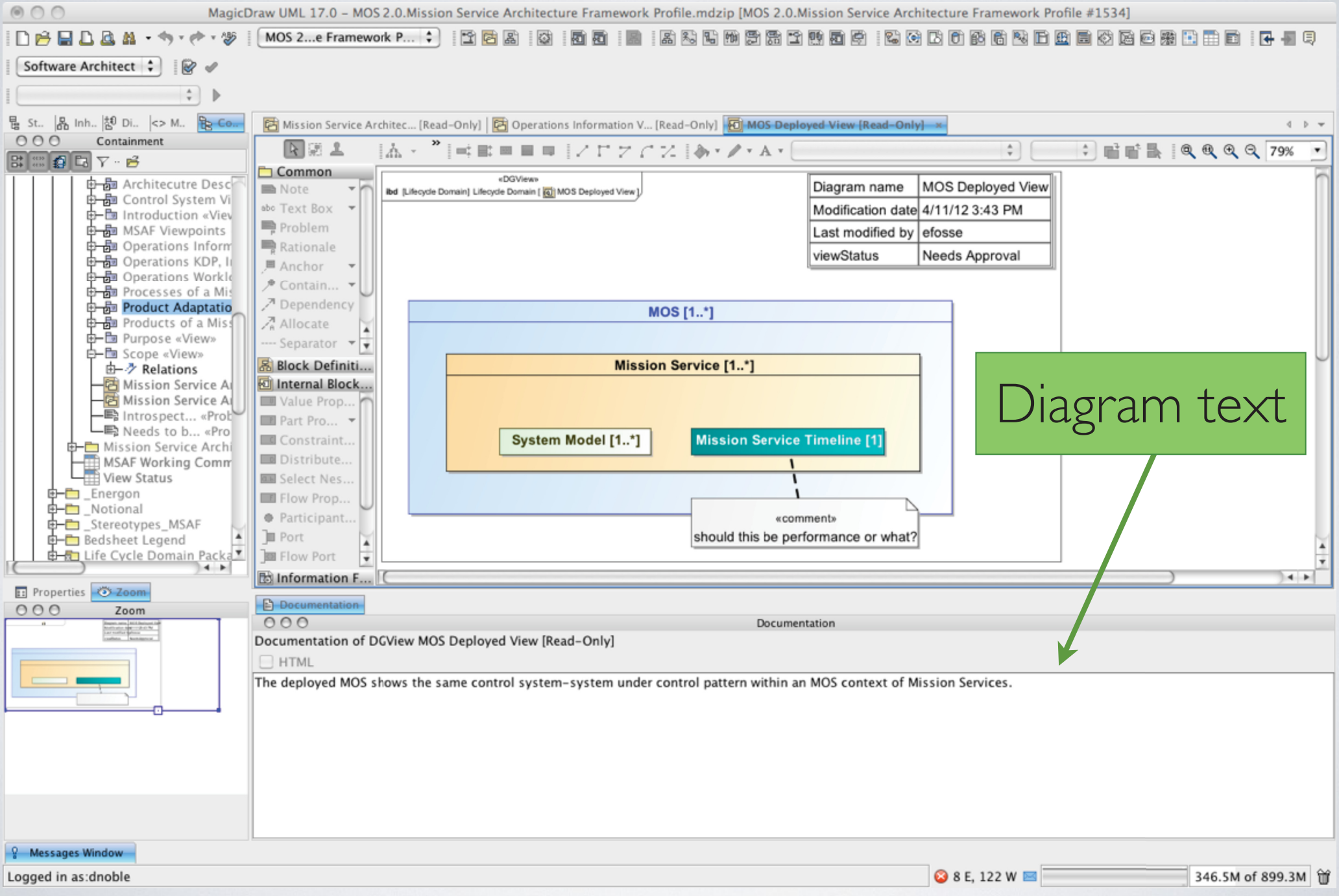
MagicDraw - *document model*



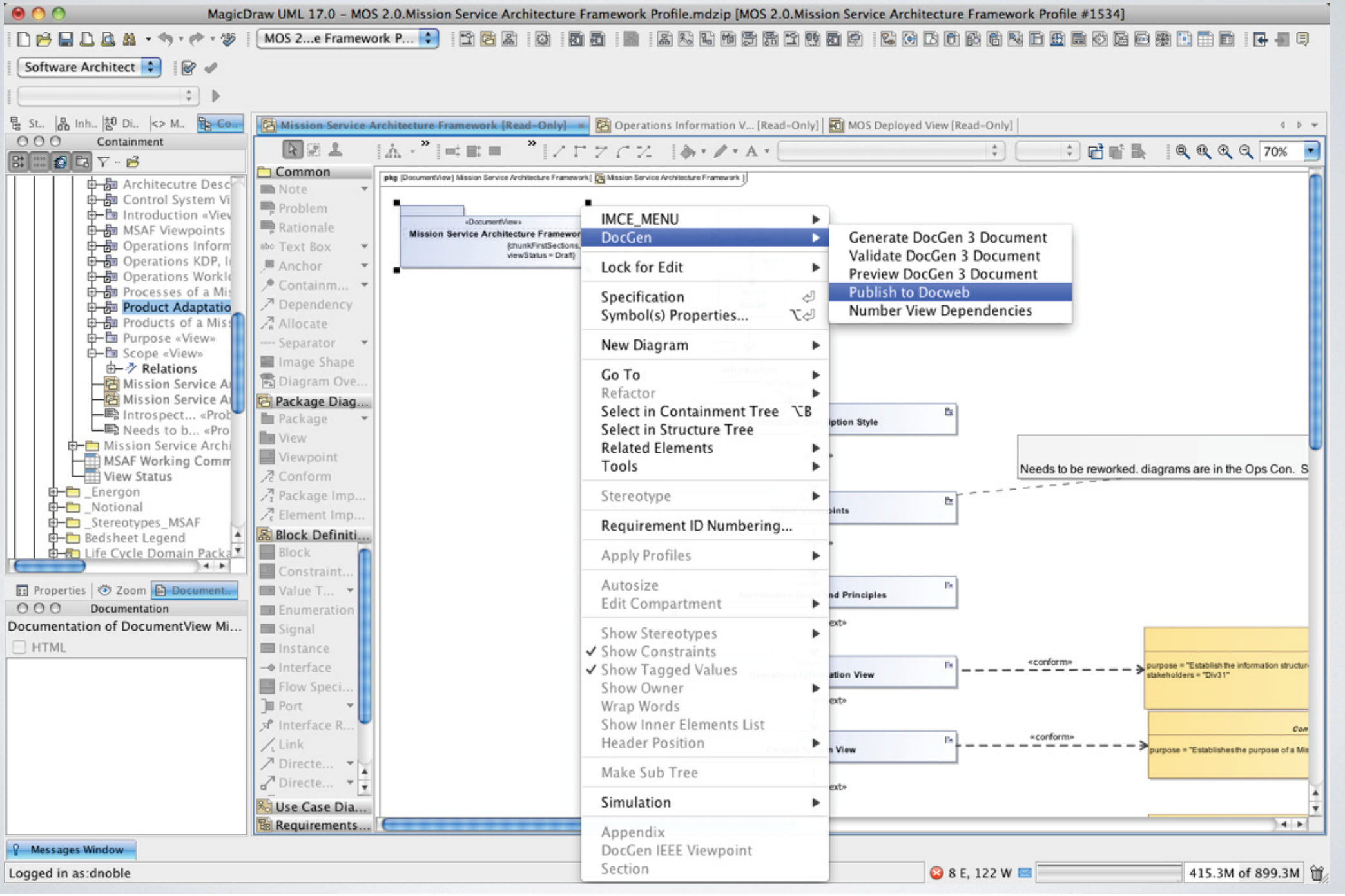
MagicDraw - *document section*



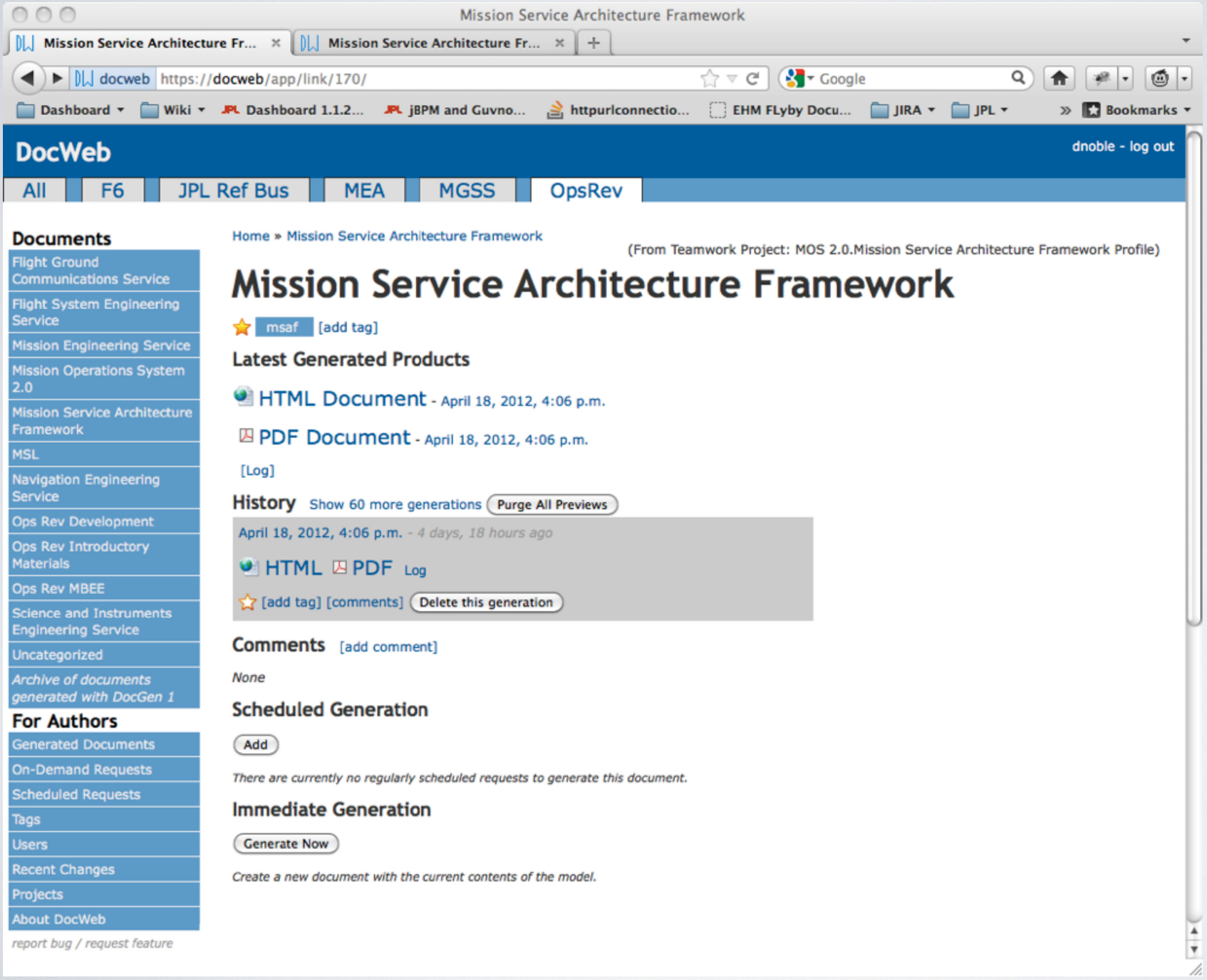
MagicDraw - *diagram & model text*



MagicDraw - *document publishing*



DocWeb - *document page*



HTML - *diagram & model text*

Mission Service Architecture Framework

Mission Service Architecture Fr... | Mission Service Architecture Fr...

https://docweb/app/generation/2583.html/

Dashboard | Wiki | Dashboard 1.1.2... | jBPM and Guvno... | httpurlconnectio... | EHM FLyby Docu... | JIRA | JPL | AWS | Tech | Howto | D2D | Bookmarks

DocWeb Mission Service Architecture Framework [msaf]

Mission Service Architecture Framework April 18, 2012, 4:06 p.m. PDF close frame [X]

7.1. MOS Deployed View

Figure 7.1. MOS Deployed View

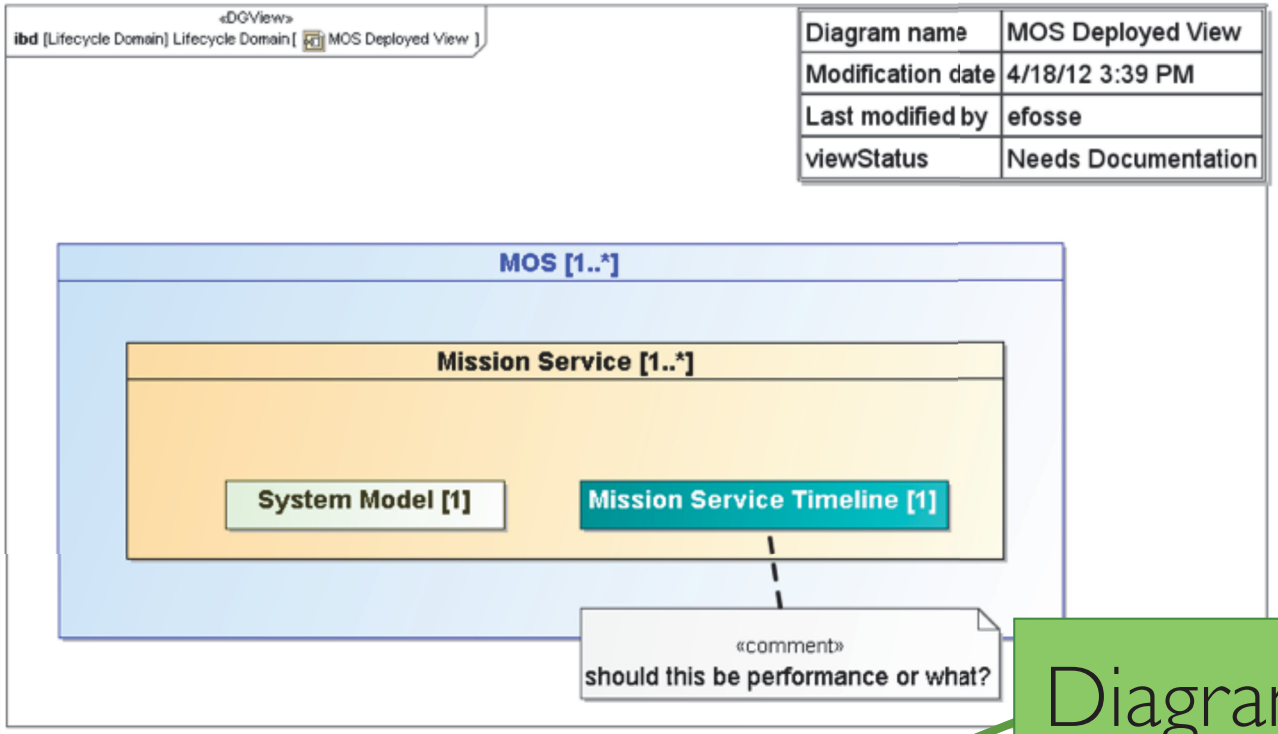


Diagram text

The deployed MOS shows the same control system-system under control pattern within an MOS context of Mission Services.

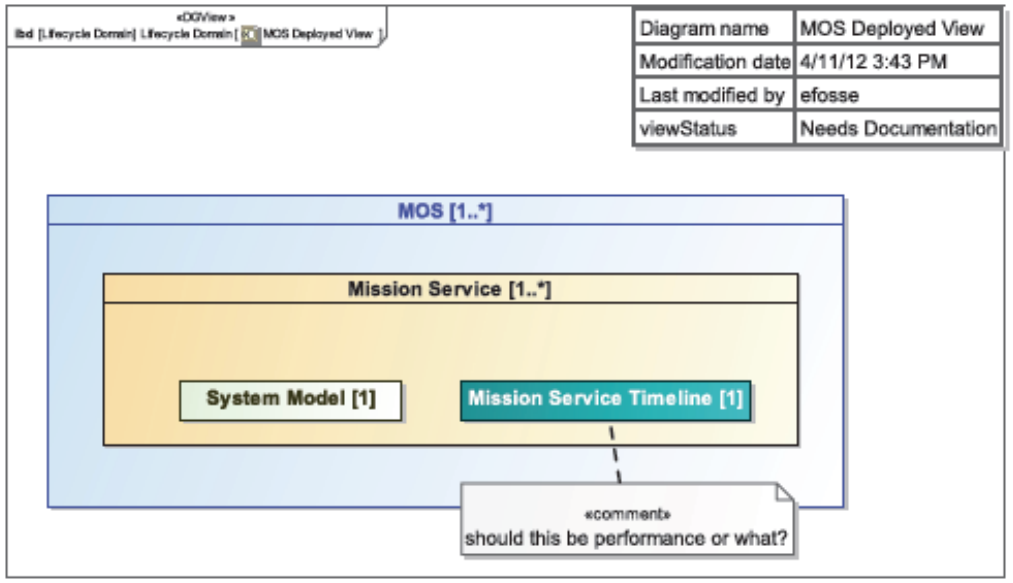
PDF - *diagram & model text*

7. Operations Information View

These views describe the end to end information used by the MOS when understood as a control system. The framework relies on the principle of timelines as representation of mission information. The timelines are flavored by control system concept which allows for the specification of critical information for Mission Operations to be used by control functions to do closed loop control.

7.1. MOS Deployed View

Figure 7.1. MOS Deployed View

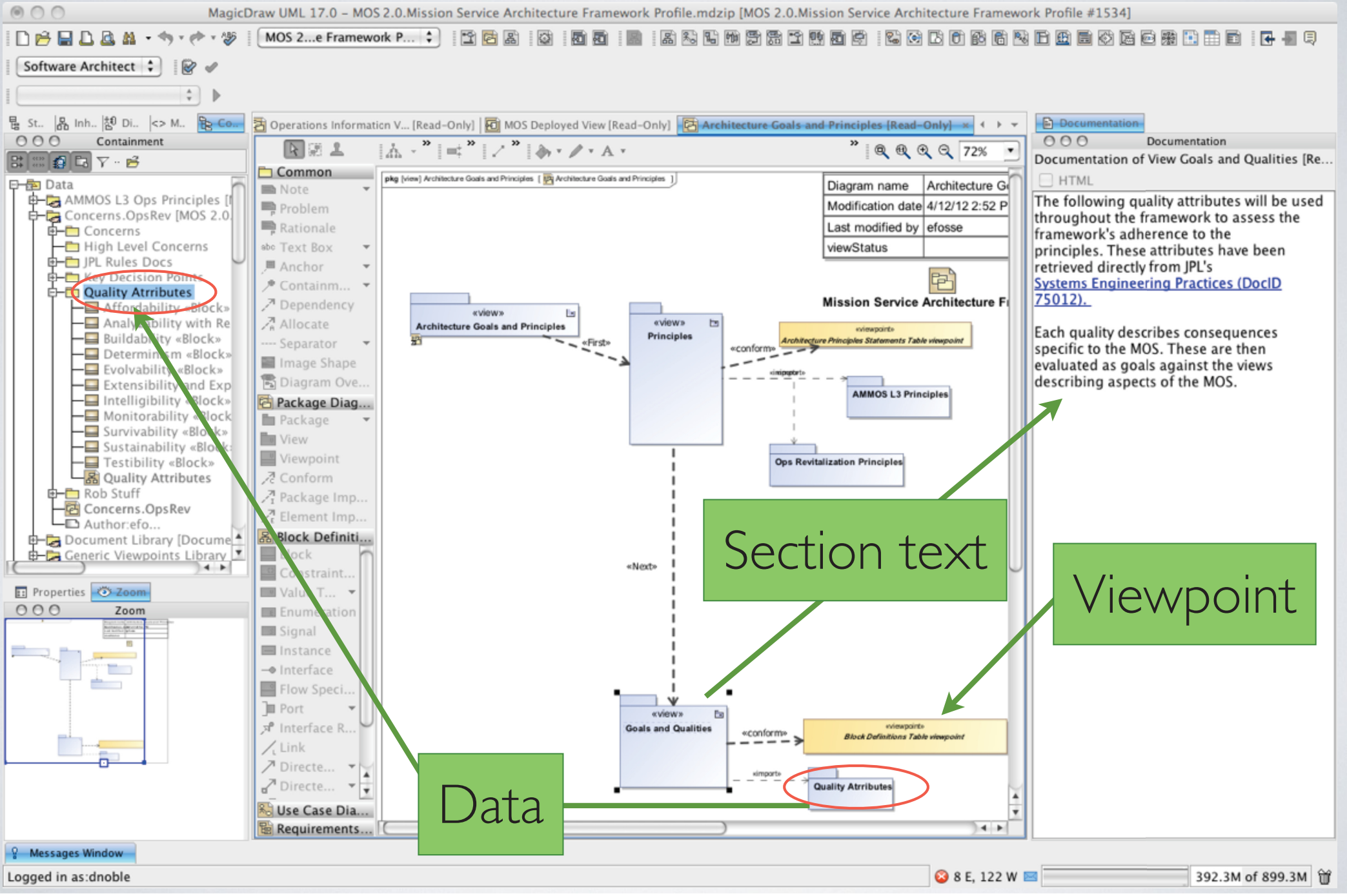


The deployed MOS shows the same control system-system under control pattern within an MOS context of Mission Services.

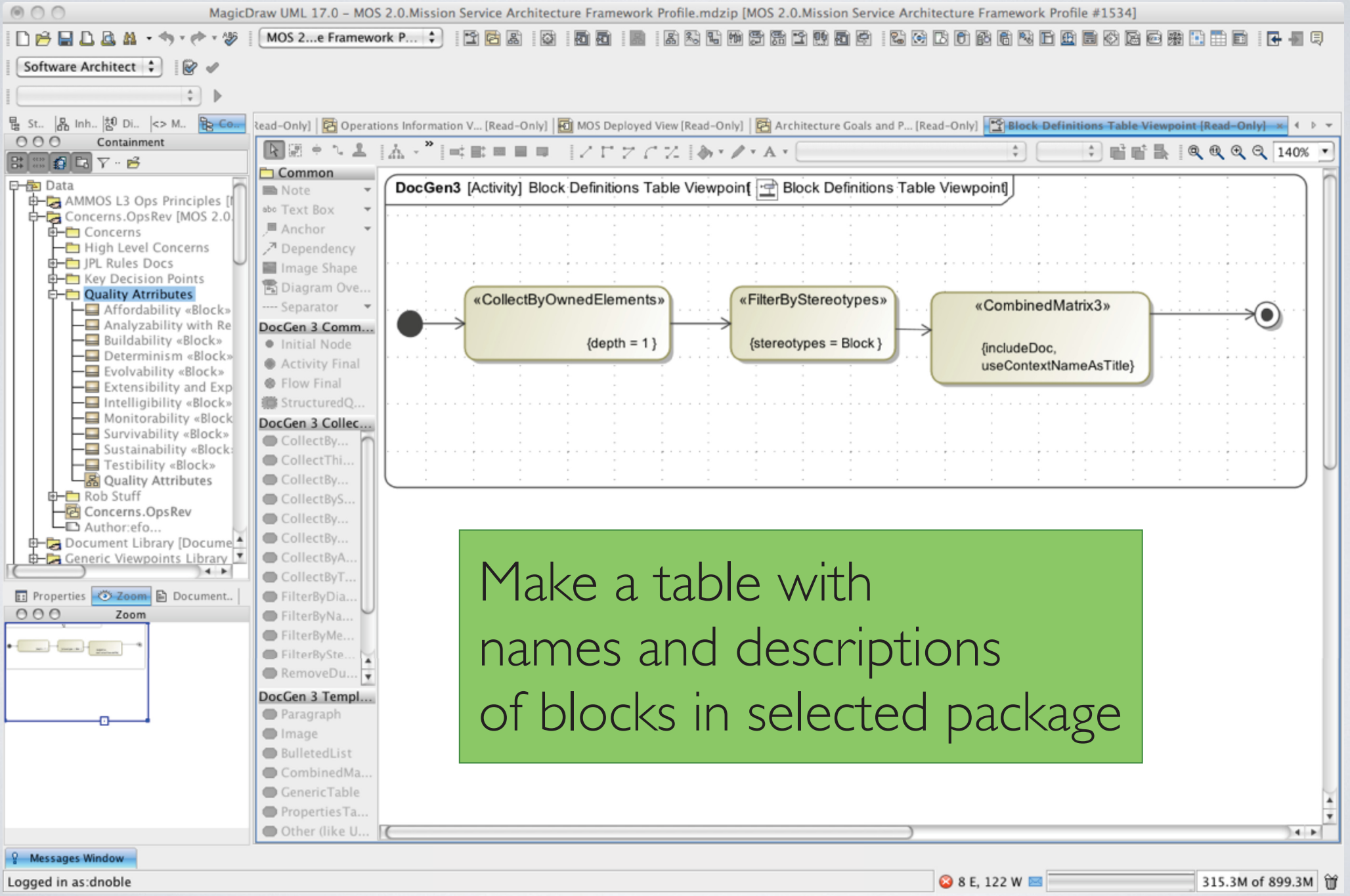
Section text

Diagram text

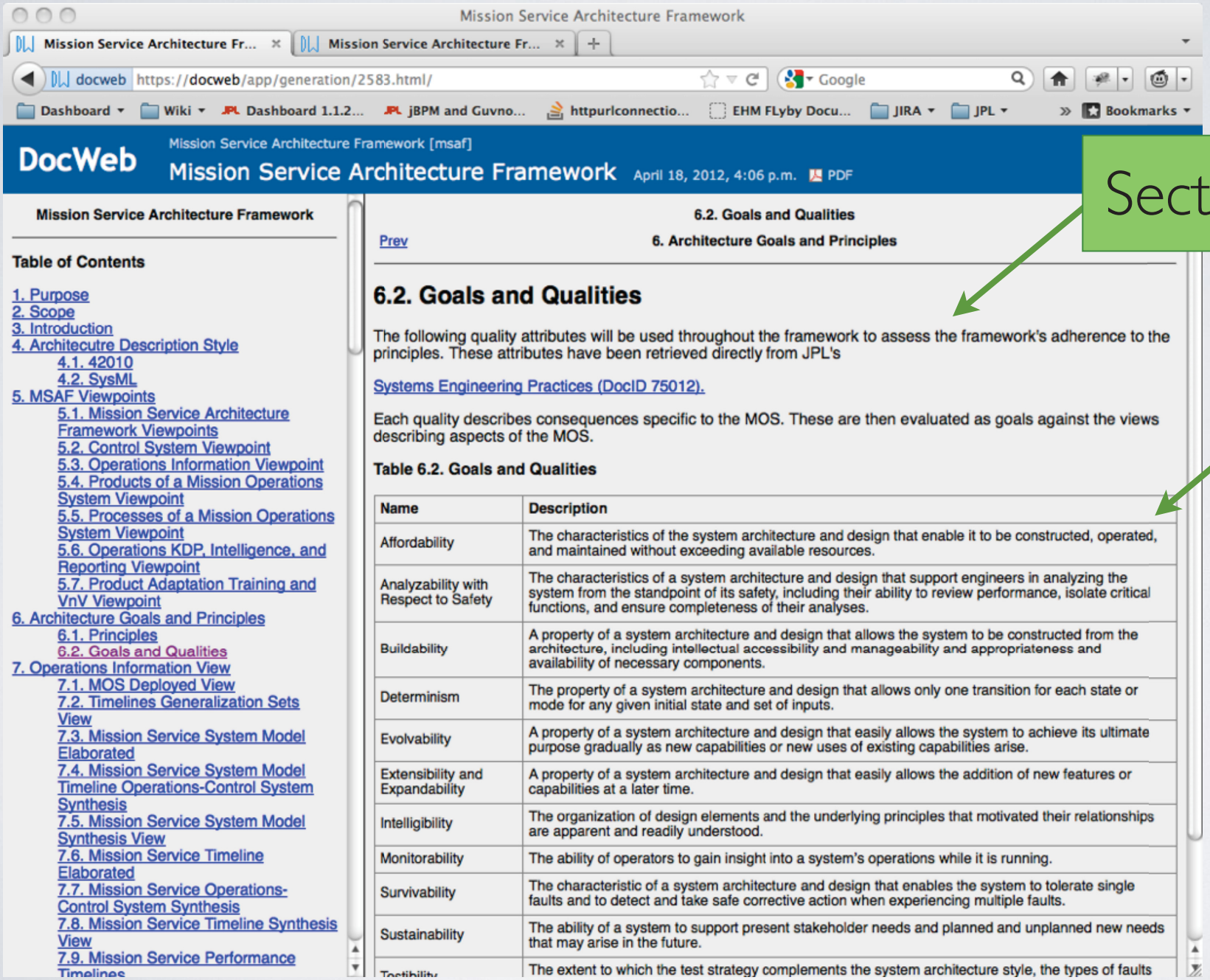
MagicDraw - *viewpoints*



MagicDraw - *viewpoint definition*



HTML - *viewpoints*



Section text

Data

6.2. Goals and Qualities

The following quality attributes will be used throughout the framework to assess the framework's adherence to the principles. These attributes have been retrieved directly from JPL's

Systems Engineering Practices (DocID 75012). [http://rules.jpl.nasa.gov/cgi/doc-gw.pl?docid=75012]

Each quality describes consequences specific to the MOS. These are then evaluated as goals against the views describing aspects of the MOS.

Table 6.2. Goals and Qualities

Name	Description
Affordability	The characteristics of the system architecture and design that enable it to be constructed, operated, and maintained without exceeding available resources.
Analyzability with Respect to Safety	The characteristics of a system architecture and design that support engineers in analyzing the system from the standpoint of its safety, including their ability to review performance, isolate critical functions, and ensure completeness of their analyses.
Buildability	A property of a system architecture and design that allows the system to be constructed from the architecture, including intellectual accessibility and manageability and appropriateness and availability of necessary components.
Determinism	The property of a system architecture and design that allows only one transition for each state or mode for any given initial state and set of inputs.
Evolvability	A property of a system architecture and design that easily allows the system to achieve its ultimate purpose gradually as new capabilities or new uses of existing capabilities arise.
Extensibility and Expandability	A property of a system architecture and design that easily allows the addition of new features or capabilities at a later time.
Intelligibility	The organization of design elements and the underlying principles that motivated their relationships are apparent and readily understood.
Monitorability	The ability of operators to gain insight into a system's operations while it is running.
Survivability	The characteristic of a system architecture and design that enables the system to tolerate single faults and to detect and take safe corrective action when experiencing multiple faults.
Sustainability	The ability of a system to support present stakeholder needs and planned and unplanned new needs that may arise in the future.
Testibility	The extent to which the test strategy complements the system architecture style, the types of faults that the strategy can detect, and the ease of detecting and diagnosing faults.

How mature is it?

DocGen and DocWeb are highly capable beta-version software. They are usable by others, but not yet complete, and not polished operational products

Key Takeaways

DocWeb and DocGen provide a powerful addition to JPL's MBSE tooling and infrastructure.

They are showing good return on investment and have become essential to Ops Rev and other MBSE projects.

Credits

Steve Jenkins - *IMCE, foundational prototyping work*

Chi Lin - *IMCE Manager*

Dave Linick - *MGSS Manager, Ops Rev sponsor*

Duane Bindschadler - *Ops Rev project manager*

Chris Delp - *Ops Rev systems architect*

David Noble - *Ops Rev software architect*

Doris Lam - *DocGen/DocWeb developer*

Ben Holden - *DocWeb developer*

Maddalena Jackson - *DocGen developer*

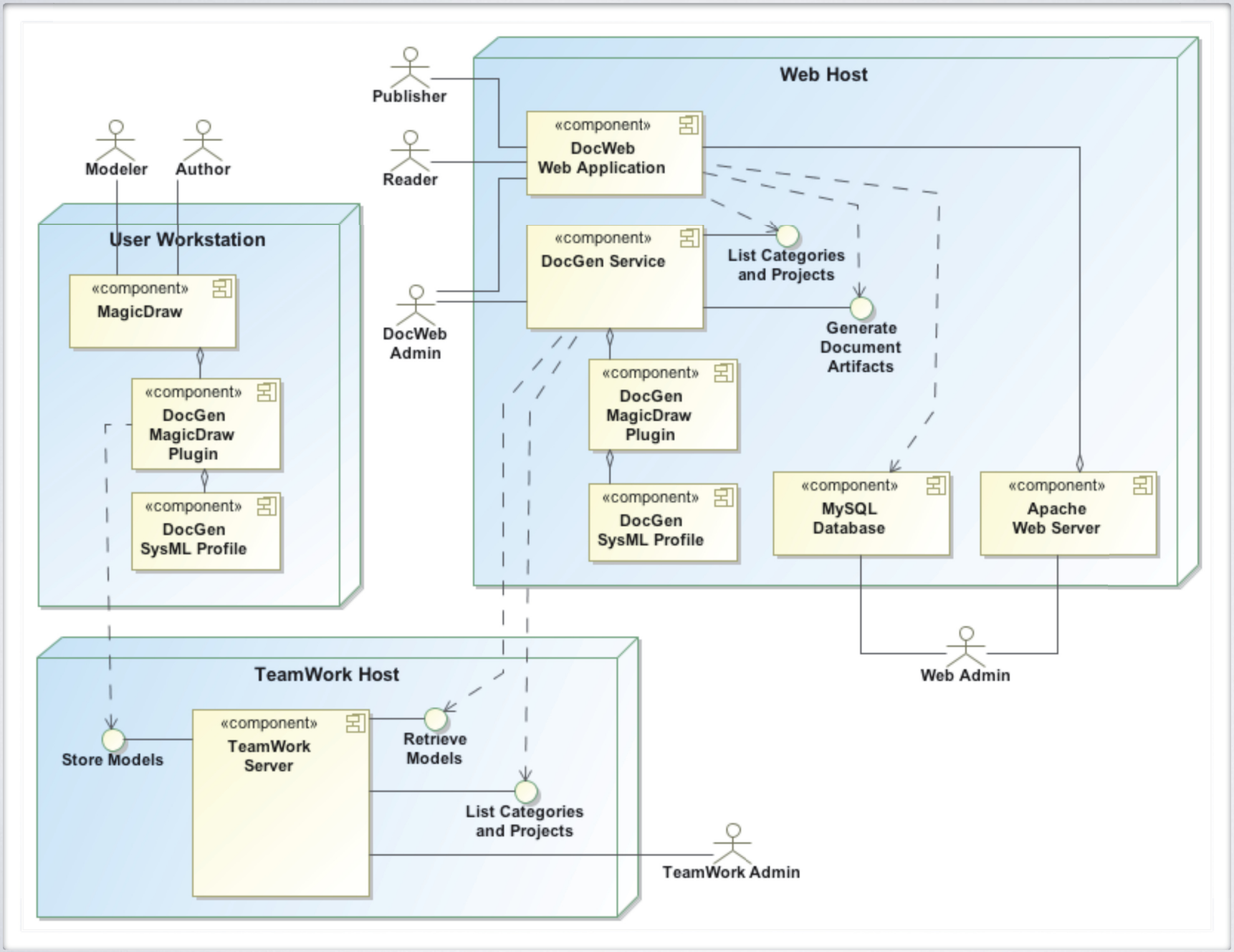
Louise Anderson - *Methodology and pattern development*

Elyse Fosse - *Methodology and pattern development*

Many thanks to all the DocGen and DocWeb users for their support and feedback

Backup Material

Components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DocGen Service
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