



University of Southern California
Center for Software Engineering

Software Architecture Attribute Analysis

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GSAW Workshop

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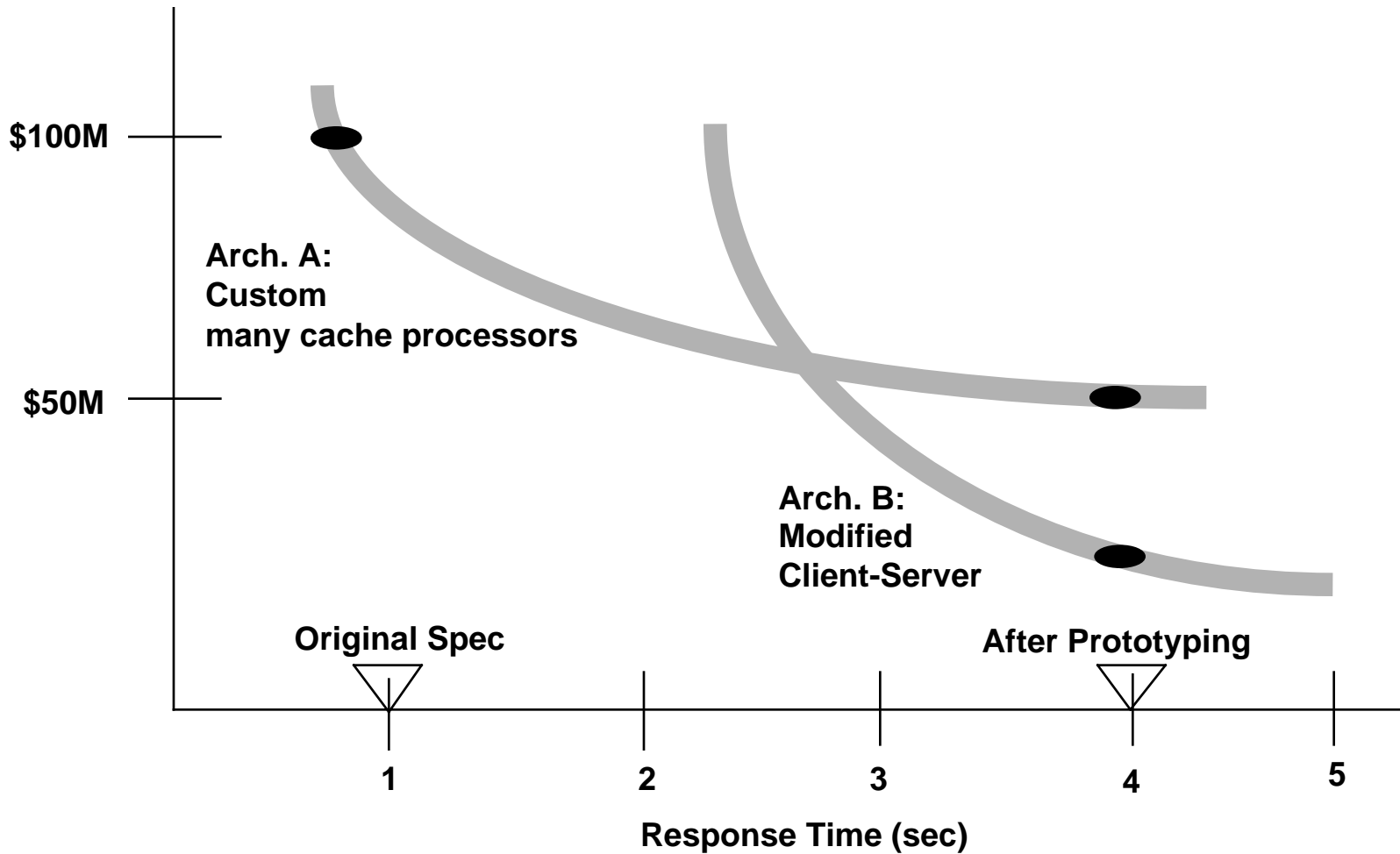


Outline

- Motivation: Getting Feasible Specs
- Field Guide to Attribute Analysis Methods
- The USC Architecture Attribute Analysis Aid (A4)



Overambitious Performance Specs





Conclusions

- Having the right software architecture is:
 - Success-critical
 - Primarily driven by attribute need levels
 - A discontinuous function of attribute levels
 - Dependent on early attribute analysis



A Field Guide to Software Architecture Attribute Analysis Methods

Method	Examples	Strengths	Potential Concerns
Interface Checking	StP, RDD-100	<ul style="list-style-type: none"> • Static integrity • Traceability 	<ul style="list-style-type: none"> • Dynamic integrity • Performance, cost, schedule analysis • Subjective attributes
Formalized Models	Rapide, Wright, HDM, AAA	<ul style="list-style-type: none"> • Static, dynamic integrity • Security • Interoperability 	<ul style="list-style-type: none"> • Model granularity and scalability • Performance, cost, schedule analysis • Subjective attributes
Scenario Analysis	SAAM	<ul style="list-style-type: none"> • Subjective attributes <ul style="list-style-type: none"> – usability, modifiability • Human-machine system attributes: <ul style="list-style-type: none"> – safety, security, survivability 	<ul style="list-style-type: none"> • Largely manual, expertise-dependent • Scenario representativeness; method scalability • Ver/Val/Accreditation • Integrity, performance, cost, schedule analysis
Simulation; Execution	Network VOA; UNAS	<ul style="list-style-type: none"> • Performance analysis • Dynamic integrity • Reliability, survivability, accuracy 	<ul style="list-style-type: none"> • Model granularity and scalability • Input scenario representativeness • Ver/Val/Accreditation • Cost, schedule, subjective attributes
Parametric Modeling	A4, COCOMO, Queuing Models	<ul style="list-style-type: none"> • Cost schedule analysis • Reliability, availability analysis • Performance analysis 	<ul style="list-style-type: none"> • Subjective attributes • Static, dynamic integrity • Ver/Val/Accreditation • Input validation



Attribute Analysis Field Guide - 2

Method	Formalized Models
Examples	Rapide, Wright, HDM, AAA
Strengths	<ul style="list-style-type: none">• Static, dynamic integrity• Security• Interoperability
Potential Concerns	<ul style="list-style-type: none">• Model granularity and scalability• Performance, cost, schedule analysis• Subjective attributes



Attribute Analysis Field Guide - 5

Method	Parametric Modeling
Examples	A4, COCOMO, Queuing Models
Strengths	<ul style="list-style-type: none">• Cost, schedule analysis• Reliability, availability• Performance analysis
Potential Concerns	<ul style="list-style-type: none">• Subjective attributes• Static, dynamic integrity• Ver/Val/Accreditation• Input Validation



Outline

- Motivation: Getting Feasible Specs
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A4 Strategy

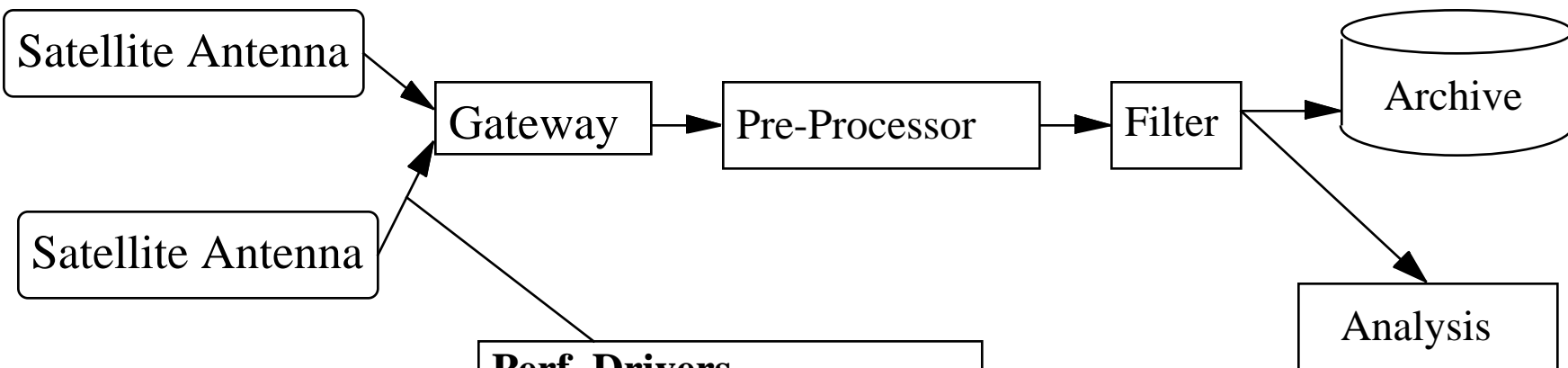
- Simple graphic front end, data manager (with TRW)
- Popup schemas for performance/cost/...drivers
- Informed about architectural styles
 - Support heterogeneous style composition
- Support export/import to/from other architecture tools
- Small footprint
 - Resource usage
 - Dependence on external packages
- Experimentally apply to satellite ground station domain (with Aerospace, TRW)



A4 Strategy: Initial Concept

System: Telemetry Processing

Style: Pipe & Filter



Perf. Drivers
Init: _____
Data Rate: _____
Term: _____
...

Cost Drivers
SLOC: _____
RELY: _____
DATA: _____
CPLX: _____
...



Conclusions

- Having the right software architecture is:
 - Success-critical
 - Primarily driven by attribute need levels
 - A discontinuous function of attribute levels
 - Dependent on early attribute analysis
- Best analysis methods vary by attribute
 - Field guide identifies usual best choices
- USC A4 Addresses:
 - Cost, schedule, interoperability (available)
 - Reliability, performance (under development)
 - Tradeoffs among these attributes