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Photos placed in horizontal position
with even amount of white space
between photos and header

SOA Service Identification

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Purpose

- The IDC Reengineering project is interested in studying potential applications of service oriented architecture (SOA) to the current and future generations of operational ground based nuclear explosion monitoring system software. This document identifies potential services in the IDC system.

Service Selection Criteria

- All candidate services have the following qualities:
 - Reusability – a service must be useful in more than one context or to more than one user.
 - Composability – a service must be useful component of a larger business need rather than serving an isolated purpose
- Candidate services are rated according to several qualities:
 - Granularity – the ratio of how much computation is performed in a single call to a service to its invocation overhead.
Assignments: coarse, medium, fine.
 - Autonomy – the likeliness of a potential service's results being used or meeting a defined need on their own versus use as an intermediate step in a larger process.
Assignments: low, medium, high.
 - Modularity – ability to describe a component with a well-defined interface, allowing for the consistent use of multiple different implementations.
Assignments: low, medium, high.

Subjectivity

- Selecting which components are ultimately implemented as services is a tradeoff of the granularity, autonomy, and modularity of the component.
- A component performing a specific, fine grained task might be a good service candidate if it has high independence or is used infrequently.
- A coarse grained task that has low independence or modularity might be better implemented as a subcomponent.
- Some components might be services for reusability but also bundled with other services for performance.
- Components isolated from automatic pipeline or interactive processing operations tend to be identified as poor candidates for services as they are unlikely to meet the reusability and/or composability criteria.

Eliminated from Consideration

- Several IDC components have been identified as not meeting the service selection criteria and have been eliminated from further consideration as services:
 - Analyst tools are interactive applications accessing services
 - System recovery is rarely initiated and independent of standard mission processing and operations. It may access services.

Service Identification

| Potential Service | Granularity | Autonomy | Modularity | Service | Notes and Questions |
|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|--|
| Data Acquisition <ul style="list-style-type: none"> IMS waveforms Waveforms received from standard external networks (NDCs, auxiliary stations) Waveforms received from non-standard external network waveforms Bulletins Non-waveform misc. resources received from State parties | C C C M - | H H H H H | H H M M L | N N N Y N | |
| Data access <ul style="list-style-type: none"> Waveforms Alphanumeric | - - | L L | M M | Y Y | <ul style="list-style-type: none"> - Modularity rating assumes a Common Object Interface and is medium due to the difficulty in defining a fully abstracted interface. - Primary concern is data access speed. |

C:Coarse F:Fine H:High L:Low M:Medium -:any valid option

Service Identification

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|--|-------------|----------|------------|---------|---|
| System logging | F | H | H | Y | <ul style="list-style-type: none"> - Handles receiving and storing log messages. - Log type is general and includes at least software processes, hardware, data acquisition, security, and pipeline health. |
| Analyst work assignment creation | F | H | H | Y | Communication overhead is immaterial for infrequently run processes. |
| Analyst work assignment distribution | F | H | H | Y | Communication overhead is immaterial for infrequently run processes. |
| Monitoring Network SOH | M | H | H | Y | Includes acquisition SOH |
| Hardware SOH | M | H | H | Y | |
| Event location | C | H | H | Y | Covers all technologies used for location. |
| Signal association | C | H | H | Y | |
| Event QC | M | M | H | Y | Might be called by an association algorithm to measure quality of proposed events. |
| Event screening | | | | | |
| • Individual criteria | F | H | H | Y | |
| • Combined criteria | C | H | H | Y | |
| Product generation - executive summaries and other external products | M | H | M | N | This is not a service because it is not <i>Composable</i> . |

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|--|------------------------|------------------|------------------|------------------|--|
| Publishing <ul style="list-style-type: none"> Bulletins Standard products Non-standard products | M M M | H H H | H H H | Y Y Y | |
| Bulletin comparison | C | H | H | Y | |
| Performance monitoring <ul style="list-style-type: none"> Network capability Station capability Event comparisons (detecting stations, picks, residuals, location, etc.) Station ambient noise | M-C M-C M-C C | H H H H | H H H H | Y Y Y Y | <ul style="list-style-type: none"> Covers comparisons between current and historical capability, analyst and automatic performance, and analyst to analyst performance. Only current to historical is appropriate for station ambient noise. |
| Capability estimation | C | H | H | Y | - |
| GIS: produce maps | M | H | H | Y | Does not include the analyst map |
| Data forwarding | - | H | H | Y | <ul style="list-style-type: none"> Forwarding targets are NDCs and any redundant IDC system(s). Transfer confirmation is included in the service. |
| Data backup | C | H | H | N | <ul style="list-style-type: none"> How do data backups currently work? Is there anything deficient in database backups? Could portions be implemented as a type of data forwarding? |

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|--|-------------|----------|------------|---------|---------------------------------------|
| Geometric operations <ul style="list-style-type: none"> Distance Point-polygon intersection Ellipse-polygon intersection Ellipse-ellipse intersection Azimuth Azimuthal gap Great circles | F | L | H | N | |
| Date/time functions | F | L | H | N | |
| Alphanumeric operations <ul style="list-style-type: none"> Network magnitude Station magnitude Yield Phase identification (also used by assoc.) | F | L | H | N | Compute one operation per invocation. |

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|---|-------------|----------|------------|---------|---------------------------------------|
| Waveform operations <ul style="list-style-type: none"> • Quality metrics • Signal detection • Arrival time • Amplitude • Period • Filtering • Beam forming • Rotation • Polarization features • Convolution and deconvolution • SNR • PSD • Spectrograms • Background noise statistics • fk • Slowness • Back-azimuth • FFT • Waveform correlation • etc. | F | L | H | N | Compute one operation per invocation. |

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|--|------------------|------------------|------------------|------------------|---|
| Earth models: general | M | M | H | Y | <ul style="list-style-type: none"> - Covers a general service, independent of type of earth model. - Compute one operation per invocation. - Operations include - Correction surfaces - Travel time - Azimuth - Slowness - Attenuation - Blockage - Uncertainties |
| Earth models : specific types <ul style="list-style-type: none"> • 1D • 2D • 2.5D • 3D | F F M M | M M M M | H H H H | N N Y Y | <ul style="list-style-type: none"> - Covers specific type of earth model. - Identical invocation structure and available operations. |

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| Earth models : specific types <ul style="list-style-type: none"> • 1D • 2D • 2.5D • 3D | L L M M | M M M M | H H H H | N N Y Y | - Covers specific type of earth model. - Identical invocation structure and available operations. |
| Classic signal detection <ul style="list-style-type: none"> • Arrival time • Phase identification • SNR • Amplitude • Period • Magnitude • Yield | M | M | H | Y | All calculations occur during a single invocation. |
| Waveform correlation based signal analysis | C | H | H | Y | Assume a full system acting as a detector, associator, locator, and screener. |
| Analyst collaboration tools | F-M | H | M | Y | |

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