

DOTS DNA Order Tracking System

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MSR



Problem



- **The deliberate misuse of DNA obtained from commercial sources to produce highly dangerous agents/organisms for use in biological terrorism is a serious threat to both public health and national security**
 - **No agency currently mandated to address this gap**
 - **Synthesis companies screen only their own orders.**
- **Can we develop a prototype DNA order tracking system capable of high-throughput data monitoring and threat assessment making use of existing techniques for sequence alignment and extensive algorithm parallelization?**

Background

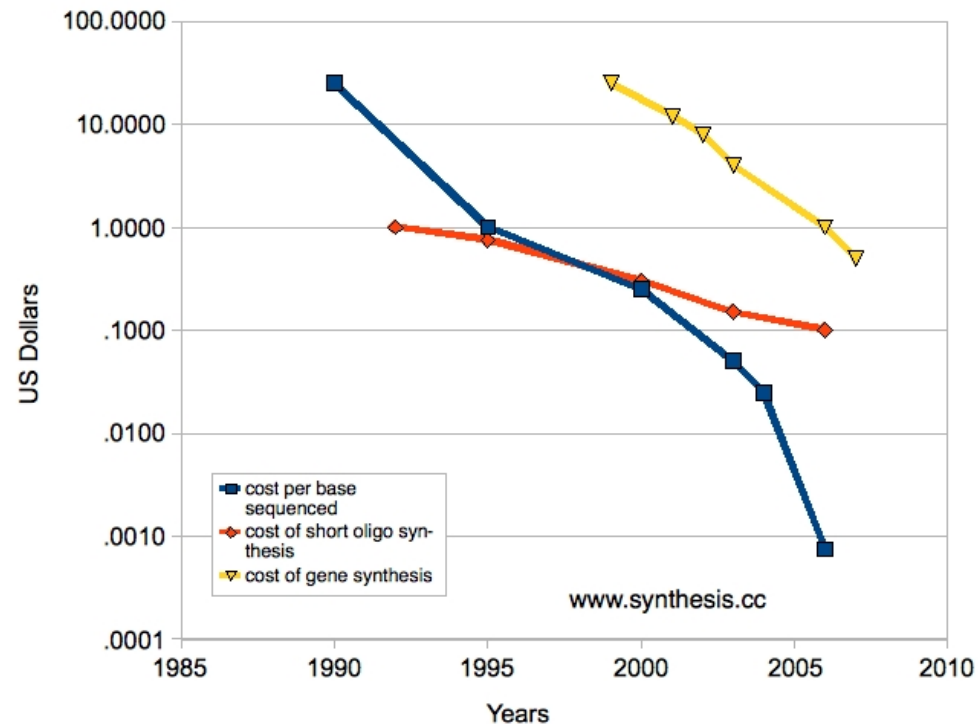
- **Synthetic DNA is a commodity**
 - **Technology is mature**
 - **Whole genes now**
 - **Simple genomes in 1-2 years**
 - **Complex genomes in 5 years**
 - **Cheap & easy to produce**
 - **\$0.15 per bp (short sequences)**
 - **\$0.45 per bp (long sequences)**

Genome Price List

Anthrax	\$2,352,281.85
Yersinia pestis	\$2,094,177.60
Variola Virus	\$83,510.10
Marburg Virus	\$8,600.20
Ebola Virus	\$8,531.55

Cost Per Base of DNA Sequencing and Synthesis

Rob Carlson, November 2008, www.synthesis.cc



Objective



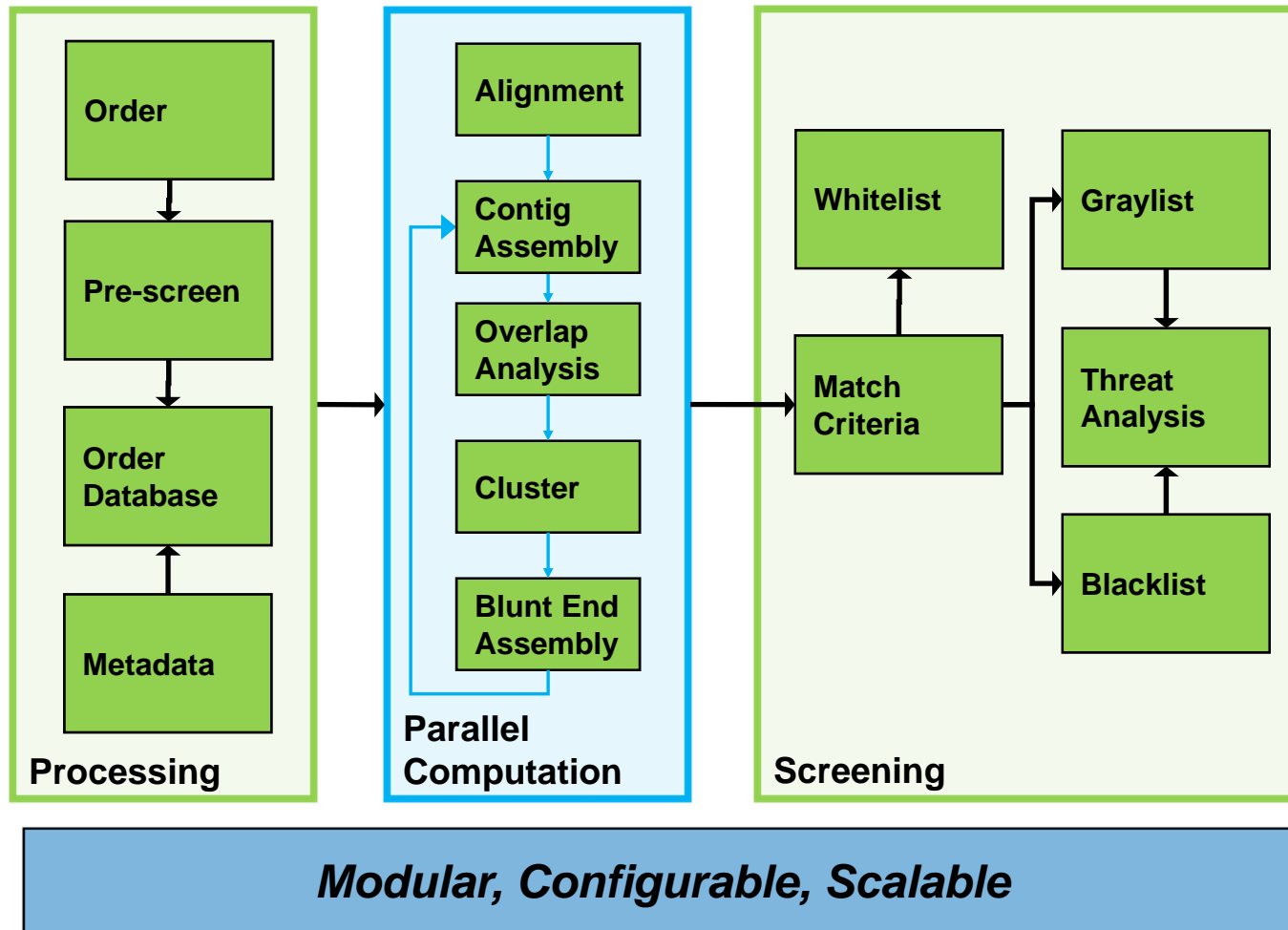
- **Identify orders for hazardous DNA sequences (ordered either whole or in parts)**
 - **Sequence alignment (comparison to known threat agents).**
- **Assess threat posed by ordered sequence**
 - **Who's ordering what?**
 - **How might it be used?**
 - **Is obfuscation intentional?**
- **Develop a concept of operations for cross-company screening in coordination with industry groups.**
- **Work with interested government parties to form a rough framework for future policy discussions.**

Activities

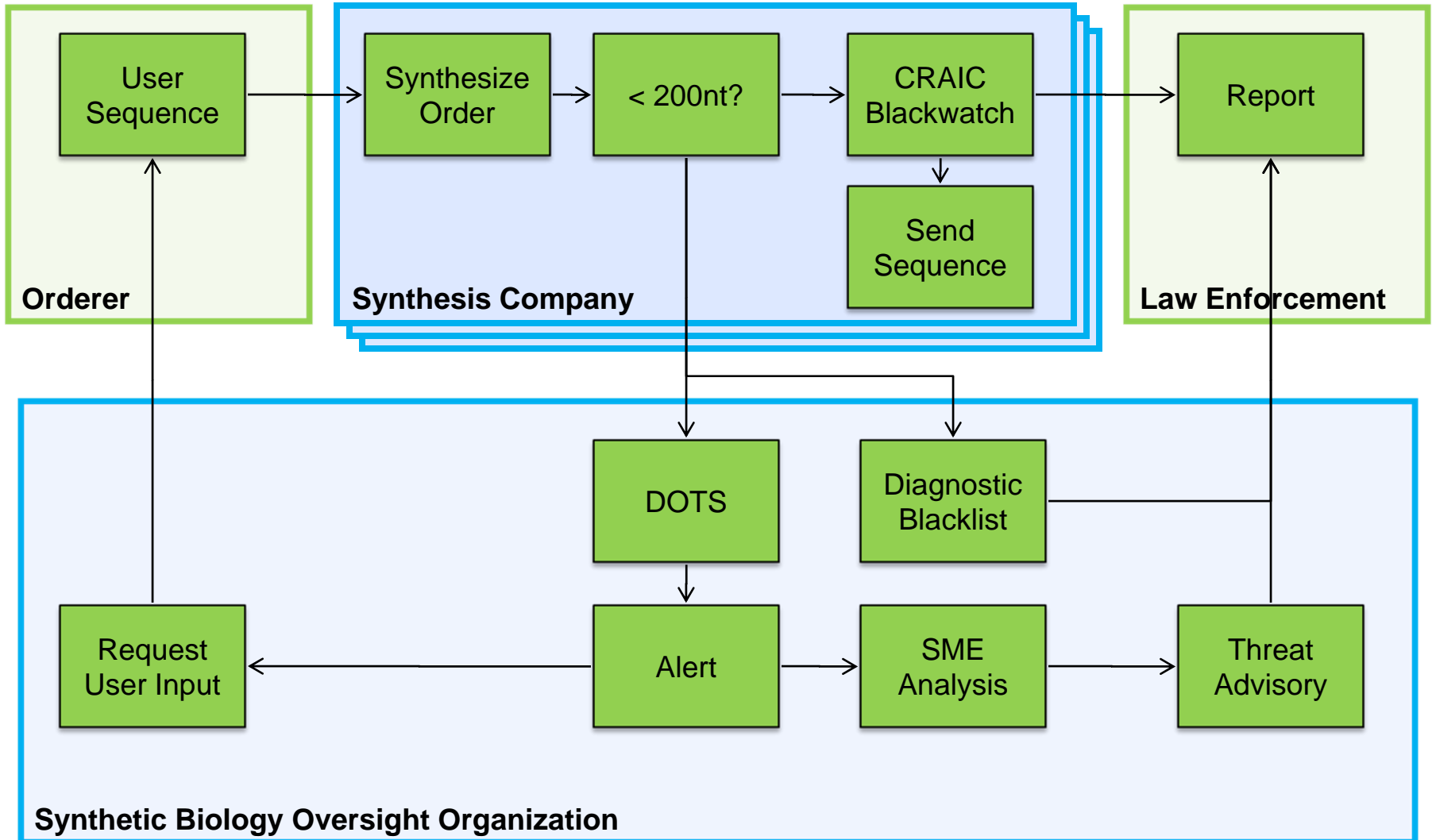


- **Prototype DNA order tracking system capable of high-throughput data monitoring and threat assessment**
 - **Projected 15M+ orders per month by 2012.**
- **Detailed characterization of both the sensitivity and overall maximum throughput of the prototype.**
- **Gap analysis of possible synthesis order obfuscation methods not yet addressed.**

Highlight



Highlight



Impacts



- **Provide a technical solution to an existing gap in national biosecurity infrastructure impacting multiple sponsor missions**
 - **“Someone should do something!”**
- **Provide a proof of concept prototype to encourage sponsor acceptance of the tractability of closing this gap and to generate acceptance among the commercial DNA synthesis market**
 - **ICPS/IASB-led discussions on unified screening**
 - **Government-led discussions on screening policy.**

Future Plans



- **Assess scalability of the system in a cluster computing environment**
 - **Hardware is required to analyze 15M+ orders per month?**

- **Transition opportunities:**
 - **Government sponsors**
 - **Industry associations (ICPS and IASB)**
 - **Run DOTS as a neutral 3rd party for screening.**