Facility Unique Designs

Background Material

ECS Release A SDPS/CSMS Critical Design Review
14 -17 August 1995

Hardware Sizing: General Assumptions

- **Sizing accommodates TRMM support through 1 year after launch, but many subsystems also look ahead to Release B "pull" requirements**
- **Both the 1/95 and 6/95 baselines were used.**
  - **Static analysis showed the difference between January and June baselines to be minimal, with no impact on Release A hardware sizing**
  - **Therefore, dynamic modeling runs were based on the January baseline**
- **Revised hours of operation (as stated in technical baseline) have been considered in sizing analysis**
  - **LaRC: 16 x 7**
  - **GSFC: 24 x 7**
  - **MSFC: 8 x 7**

LaRC Processing: AQAHW CI

- **Provides client-like access to production data for time series analysis, visualization checks and report generation.**
- **Visualization may be required**
- **Pulls production data sets for analysis**
  - **Assumed 20% of average daily routine production (1 in 5 check)**
  - **Network I/O = 11.4 KBps (57 KBps, burst)**
  - **Backplane I/O < 1 MBps**
  - **Disk Volume = 2 * (20% of daily production) + 10% contingency**
    - » **= 1.4 GB**
- **Use of a 5-10 GB disk will allow for temporary storage of multiple production set instances, and yet have reserved capacity for report storage and maintenance of time series statistics**

LaRC Processing: AITHW CI

- **Release A configuration is the same as Ir1**
- **Provides operations support to enable DAAC personnel to configure, control and manage AI&T processes on target science processors**
- **Includes operations workstation and a small server**

Data Server Subsystem General Sizing Assumptions

- **V0 Migration Over Rel. A Duration (Baseline 6/95)**

  Data Sets Identified as pre-Rel. A Initial Operation

  + Data Sets Identified for Migration during Rel. B Operations

- **Dynamic Modeling Used in Sizing the Robotics and Tape Drives of the Data Server Archive as well as the Production Staging Area of the Working Storage Disk**

Data Server Subsystem General Sizing Philosophy

- **APC Disk Size = (Daily Data Server Data Intake) x 2 days**

  All <u>DAAC external</u> electronic push/pull staging is on the APC disk

- **Working Storage Sizing:**

  Production Staging Area (+10% for failed products)

  + Electronic Distribution/Ingest Staging Area [User modeling access pattern prediction for 1/2 hour of operation - 4 users accessing simultaneously]

  + Hard Media Distribution/Ingest Staging Area [single largest data granule]

  There is residency associated with the production staging area (following slides).

  No latency is associated with the electronic and hard media distribution/ ingest areas.

- **Distribution (hard media) Disk Size = Daily Data Server Data Intake**

LaRC Base Figures/Component Calculations

- **Daily Data Server Data Intake (TRMM & V0) = 15.51 GB**
- **Total Daily Distribution from Data Server = 2 x Intake = 31.02 GB**

  Electronic Distribution - 15.51 GB

  APC Disk Size = (15.51x2) + (15.51x2)x0.2 = 37.2 GB ~> 40 GB
  distribution + ingest

  Hard Media Distribution - 15.51 GB

  DIPHW Disk Size = 15.51 + 15.51x0.1 = 17.1 GB ~> 20 GB
  distribution + ingest

- **Total TRMM Accumulation - 4,143 GB**
- **Total V0 Transition Data in Rel. A - 1,139 GB**

  Media Purchase = (4,143 + 1,139) + (4,143 + 1,139)x 0.2 + (4,143 + 1,139)x0.1 = 6,867 GB
  backup + spare media

- **Dynamic Modeling Results**

  Processing Related Disk [15 min latency staging area + min (1 tape or 24 hrs latency)] - 27.04 GB

  Robotics Utilization - 0.11 ~> 1 Robotic Arm

  Tape Drive Utilization - 0.47 ~> 2 Drives

LaRC Base Figures/Component Calculations

- **LaRC Working Storage:**

  [16.02GB + 11.02GB + 11.02GB x 0.1]
  blocking buffer (24 hrs latency) + products buffer (15 min latency) + failed products

  + [3.6GB x 4 + 3.6GB]
  Electronic Distribution/Ingest Staging Area [User modeling access pattern prediction for 1/2 hour of operation - 4 users accessing simultaneously]. No latency.

  + 3.6GB
  Hard Media Distribution/Ingest Staging Area [single largest data granule]. No latency.

  = 49.6 GB ~> 50 GB

- **Computed Core Metadata DBMS Disk Size = 396.7 MB ~> 10 GB**
- **Computed Doc. Data Server Collection Size = 138 MB ~> 6 GB**

LaRC Planning Subsystem: PLNHW

- **Processing requirements based on static analysis**
- **Processing and storage capacity designed to meet Release B requirements**
- **Factors considered in analysis included:**
  - **Planning DBMS size**
  - **Activations per day**
  - **Files input and output from processing per day**
  - **Files input and output from average job per day**
  - **One 30-day plan per 2 weeks, one 10-day plan per week, daily plans**
- **Estimated frequency of high-leverage planning functions (e.g., candidate plan creation)**
- **Identified subactivities within functions, and estimated processing load for each based on complexity**
- **Job submission overhead was derived from benchmark candidate planning and scheduling products**

LaRC CIDM: DMGHW CI

Capacity Sizing Rationale

- **Performance derived from User Characterization model and transaction per search rate analysis.**
- **Release B User Characterization analysis applied to Release A design.**
- **Performance drivers for Release A DMGHW CI are slight, given the user modeling baseline**
- **Scalability, evolvability and migration to Release B are key design drivers.**
- **Current sizing estimates will be refined as a result of the Gateway CI, EP6, and Prototype Workshop 2 prototyping activities.**

LaRC CIDM: DMGHW CI

Preliminary Performance Analysis

- **Gateway CI and Advertising Service CI DBMS Transaction Summary:**

User Type	DBMS	Searches/hour	Transactions/hour	TPM
Science	Gateway/Advertising	32	341	6
Non-Science	Gateway	25	264	4
Non-Science	Advertising	152	762	13
Totals:		209	1367	23

- **The transaction loading table was based on processing assumptions for the number of DBMS transactions per search invocation**
- **Transaction ratings per search invocation will be revised based on future prototyping/benchmarking activities**
- **Processing loads associated with LIMGR, DIMGR and Data Dictionary CIs will be added in Release B**

MSS/CSS Subsystems: MSS-HW and CSS-DCHCI

- **CSS and MSS processing sized for Release B; storage sized for Release A**
- **CSS server provides DCE replication server functionality and e-mail**
- **MSS server provides for HP Openview, Sybase, and Remedy, as well as MSS Management Data Access**
- **MSS workstation provides for CM COTS, Sybase client, and tools**
- **CSS and MSS servers are configured to provide warm backup, via cross-strapped RAID**
- **Servers sized to handle both CSS and MSS load (worst case). This can also enable separate infrastructure support for parallel test activities.**

MSS/CSS Subsystems: Processing Capacity

Server Load Sources	Basis of Estimate
Basic Configuration (HP Openview, DCE Client and Operating System	Peak loads observed during EDF benchmarks of typical HP Openview operator functions (nominal polling)
Additional HP Openview data collection, based on LaRC configuration	Static analysis based on # managed objects, # MIB attributes, polling frequency, and HP instructions per transaction
Sybase Server (Mgmt DBMS)	Early Sybase benchmarks
MDA Log Conversion	Analysis based on MSS SLOC estimates for MDA, number of logged events per day at LaRC, assuming 8 hour processing of logs to DBMS
Operator tools and utility services (word processing, spreadsheet, mail, file transfer)	EDF experience
Clearcase CM tool	EDF experience
DCE Server	EDF experience, analysis

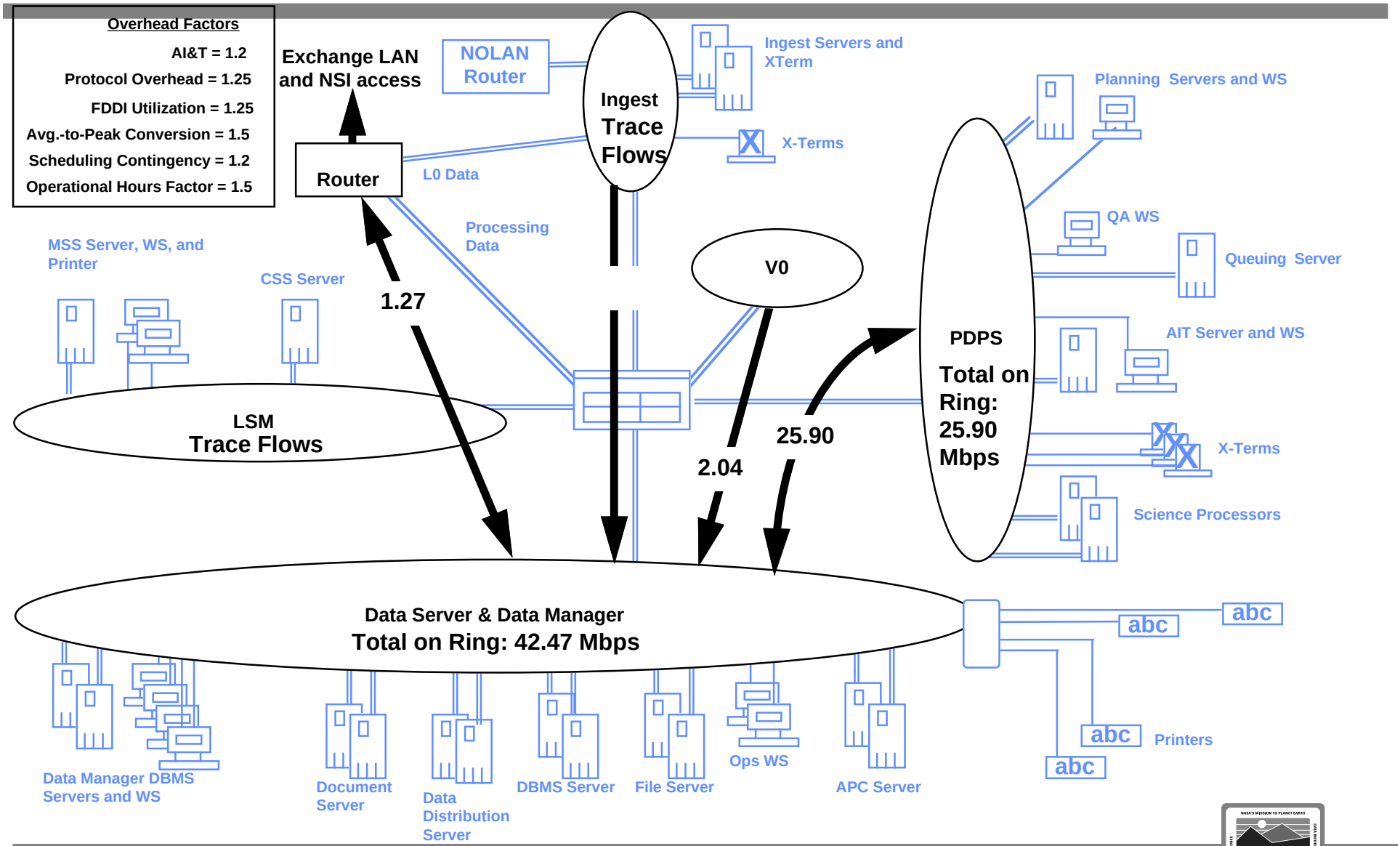
MSS/CSS Subsystems: Storage Requirements Analysis

Datastore	Storage (MB)	Basis of Estimate
HP Openview	156	# of managed objects, # of MIB attributes, size of MIB attributes, frequency of collection, assuming 14 day holdings
Application Log Files	85	# of application transactions, # of logged events, size of event, assuming 14 day holding
Sybase DBMS	510	Size of logs and HP Openview datastores, assumed one month of data maintained.
Clearcase	2,907	Assumes storage of 2 copies ECS and algorithm source, 2 copies of all executables.
Other COTS and Product Executables	3,128	Vendor specifications for COTS products
Total Storage Need for LaRC, Release A	6,777	

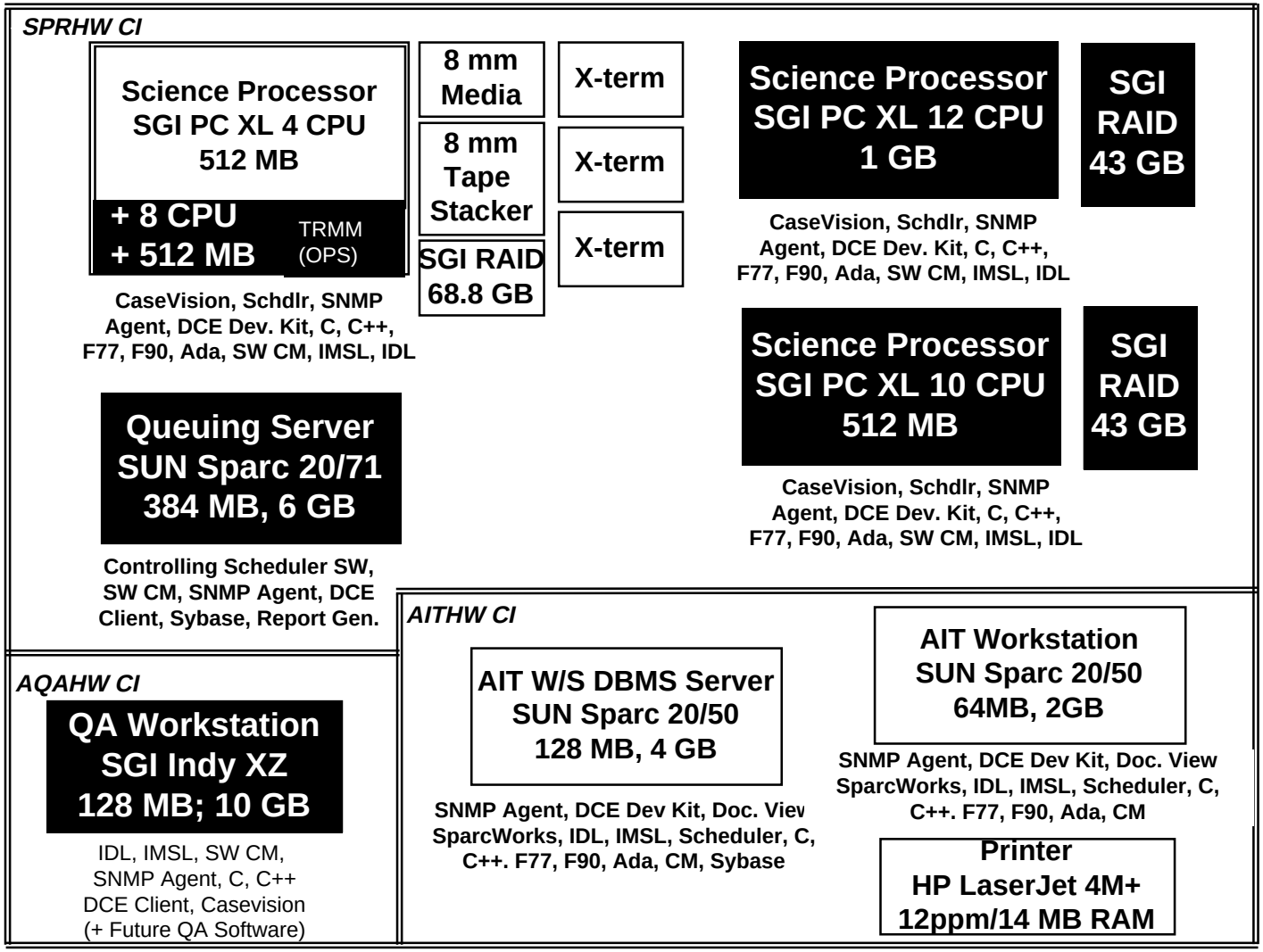
Network Overhead Factors

- **<u>AI&T:</u> accounts for AI&T traffic; factor of 1.2 (20%)**
- **<u>Protocol Efficiency:</u> accounts for TCP/IP overhead; factor of 1.25 (25%)**
- **<u>FDDI Utilization:</u> accounts for 75Mbps of available FDDI bandwidth; factor of 1.25 (25%)**
- **<u>Scheduling Contingency:</u> accounts for DAACs ability to catch-up with processing with a 4 hour down-time; factor of 1.2 (based on performing 24 hours of data flows in 20 hours)**
- **<u>Operational Hours:</u> accounts for percentage of time that DAAC processing occurs; this factor only applied to flows related to or dependent upon processing; factor of 1 at GSFC (24/24), 1.5 at LaRC (24/16), and 3 at MSFC (24/8)**

LaRC Peak Network Flows (in Mbps)



LaRC Processing Subsystem At Release A



LaRC Planning Subsystem

PLNHW

Planning Server
SUN Sparc 20/71
384 MB, 6GB

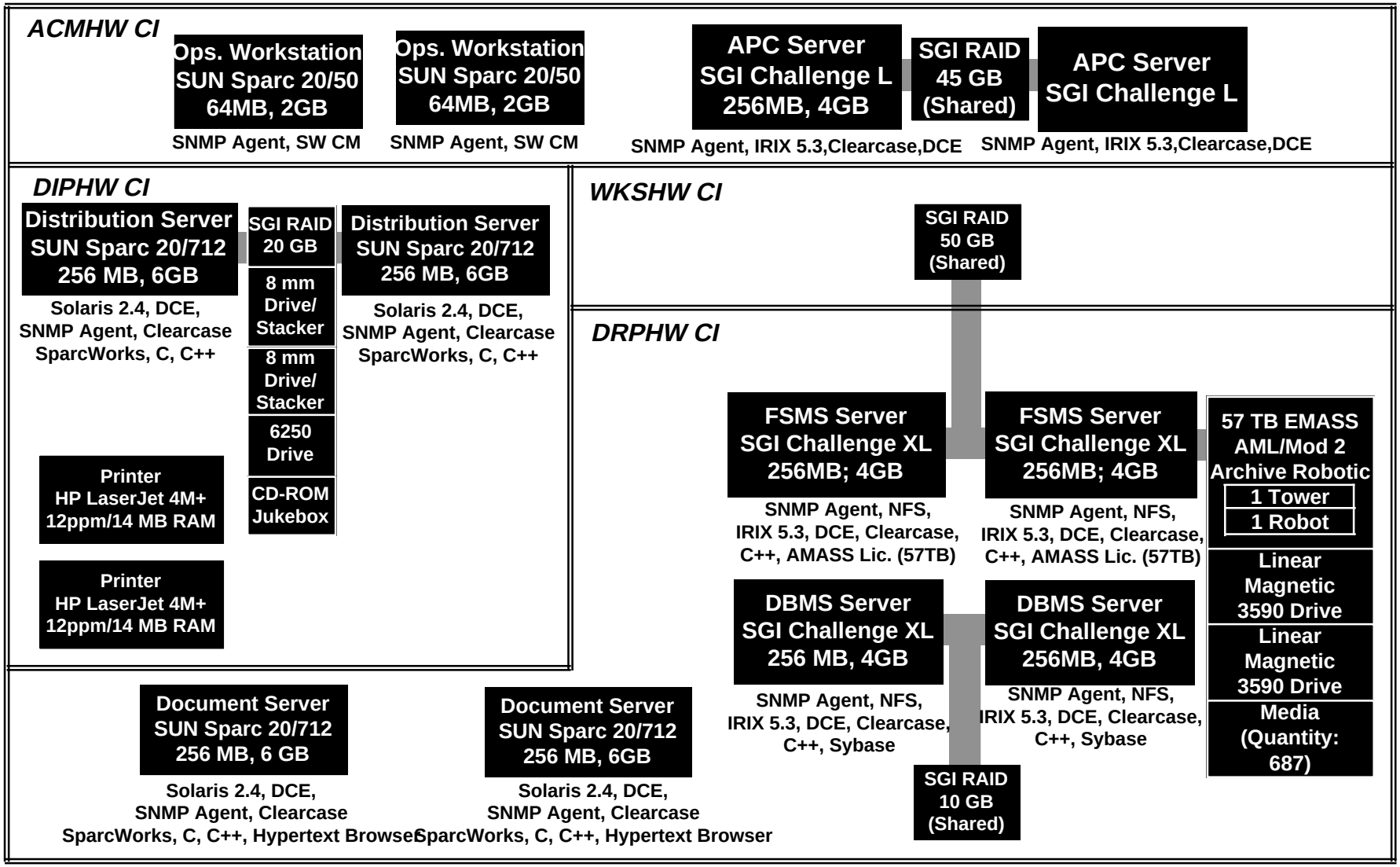
SNMP Agent, SW CM,
Sybase, Rept. Gen.
Controlling Scheduling SW
C, C++, Sparcworks

Planning Workstation
SUN Sparc 20/50
64 MB RAM

SNMP Agent, SW CM
C, C++ Sparcworks

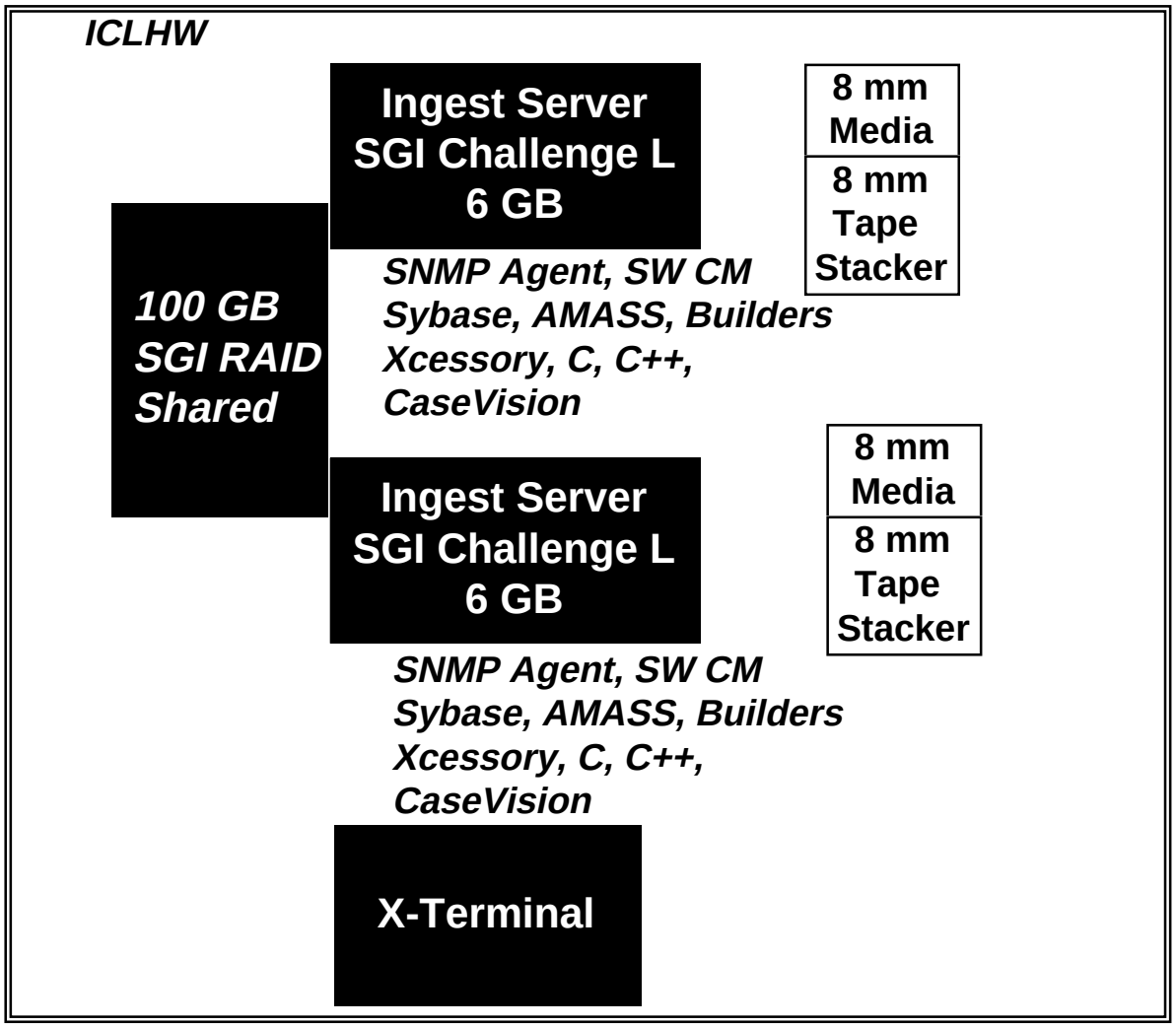
KEY: Ir1 - ☐ Release A - ■

LaRC Data Server For Release A



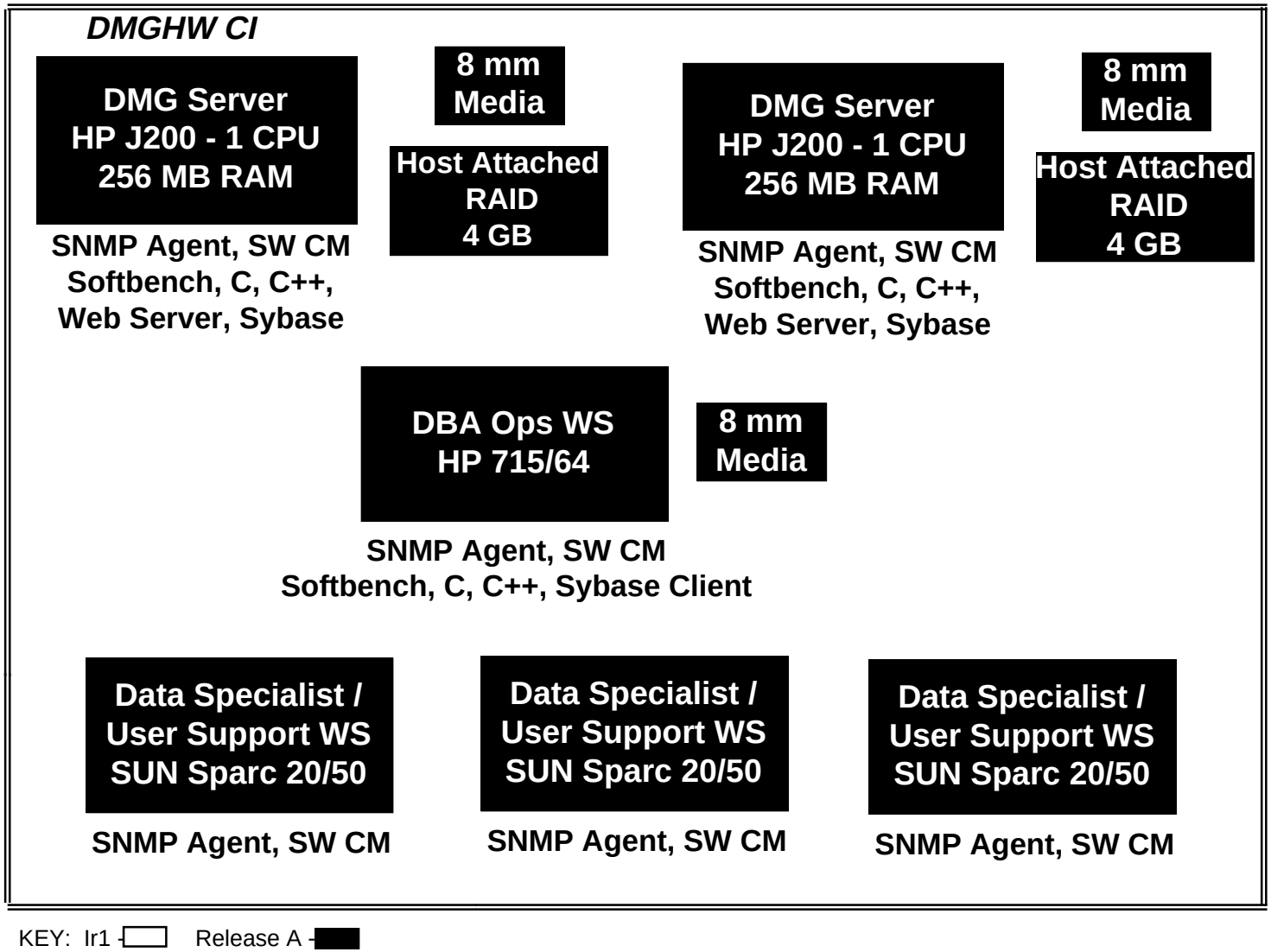
KEY: Ir1 - ☐ Release A - ■

LaRC Ingest Subsystem



KEY: Ir1 - Release A -

LaRC Data Management Subsystem



KEY: Ir1 - ☐ Release A - ■

LaRC CSS and MSS Subsystems

MSS-HWCI and CSS-DCHCI

HP RAID, Shared
20 GB

MSS Server
HP 755/25
256 MB

OpenView, Fault/Perf. Mgmt,
Trouble Ticket, Sec. Mgmt,
Sybase, SNMP Agent,
DCE Client, C, C++

CSS Server
HP 755/25
256 MB

DCE Name, Security
SNMP Agent, SW CM,
Softbench, C, C++

MSS Workstation
SUN Sparc 20/50
96 MB RAM; 2 GB

+32 MB RAM, + 2 GB

SW CM Server (Clearcase)
DDTS, Baseline Mgr,
SNMP Agent, Sybase Client,
DCE Client

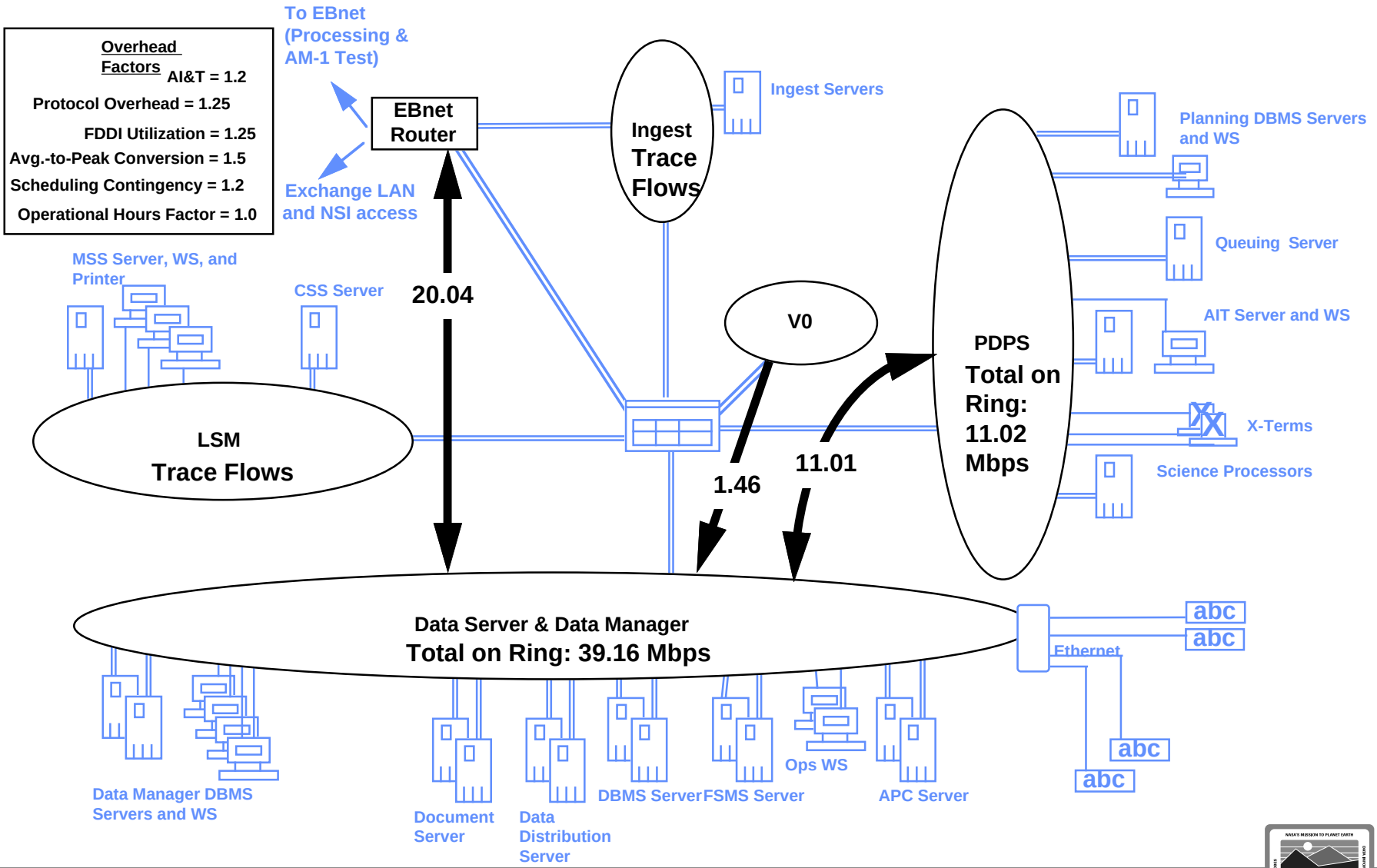
MSS Workstation
SUN Sparc 20/50
64 MB RAM; 2 GB

SNMP Agent,
DCE Client, C, C++,
Sparcworks

Printer
HP LaserJet 4M+
12ppm/14 MB RAM

KEY: Ir1 - ☐ Release A - ■

GSFC Peak Network Flows (in Mbps)



GSFC Processing Subsystem At Release A

SPRHW CI

Science Processor
SGI PC XL 6 CPU
CD ROM; 2 GB
(AM-1 AI&T)

+ 6 CPUs

CaseVision, SNMP Agent, DCE Dev. Kit, C, C++, F77, F90, SW CM, IMSL, IDL

8 mm Media

8 mm Tape Stacker

SGI RAID 68.8 GB

SGI RAID 64.5 GB

X-term

X-term

AQAHW CI

(No QA H/W at EDC During Release A)

AITHW CI

AIT Workstation
SUN Sparc 20/50
64MB, 2GB

SNMP Agent, DCE Dev Kit, Doc. View SparcWorks, IDL, IMSL, Scheduler, C, C++. F77, F90, CM,

AIT W/S DBMS Server
SUN Sparc 20/50
128 MB, 4 GB

SNMP Agent, DCE Dev Kit, Doc. View SparcWorks, IDL, IMSL, Scheduler, C, C++. F77, F90, CM, Sybase

Printer
HP LaserJet 4M+
12ppm/14 MB RAM

KEY: Ir1 - ☐ Release A - ■

GSFC Planning Subsystem

PLNHW

Planning Server
SUN Sparc 20/71
384 MB, 6GB

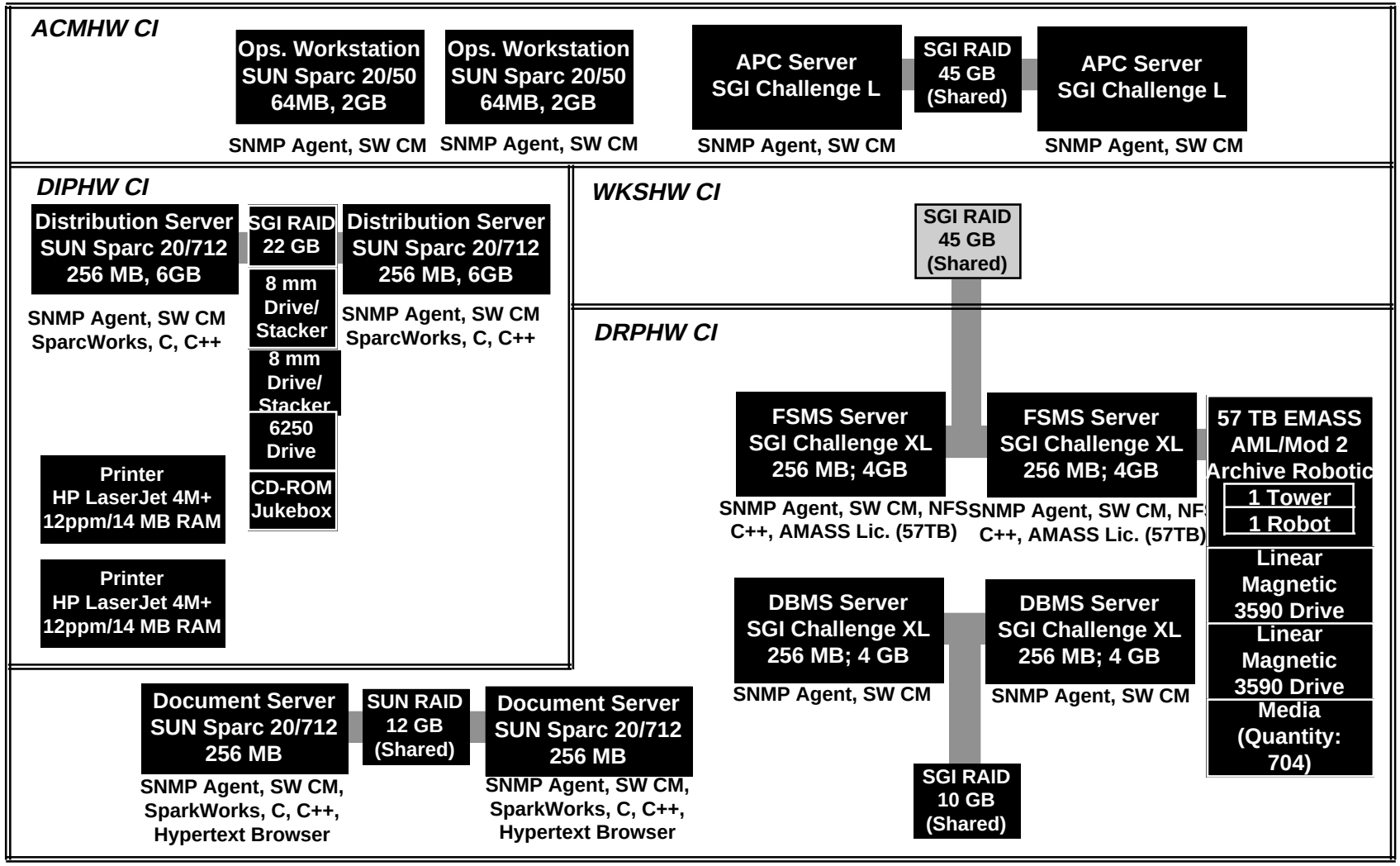
SNMP Agent, SW CM,
Sybase, Rept. Gen.
Controlling Scheduling SW
C, C++, Sparcworks

Planning Workstation
SUN Sparc 20/50
64 MB RAM

SNMP Agent, SW CM
C, C++ Sparcworks

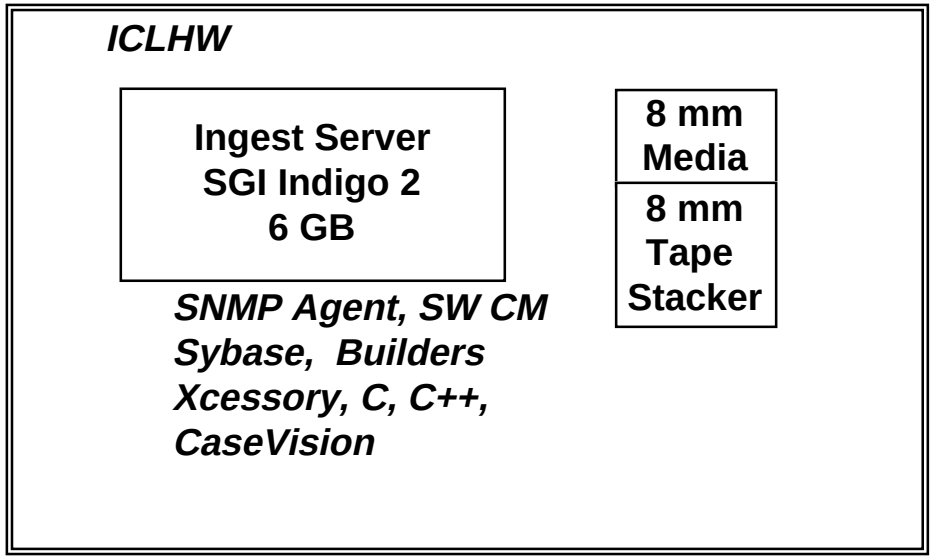
KEY: Ir1 - ☐ Release A - ■

GSFC Data Server For Release A



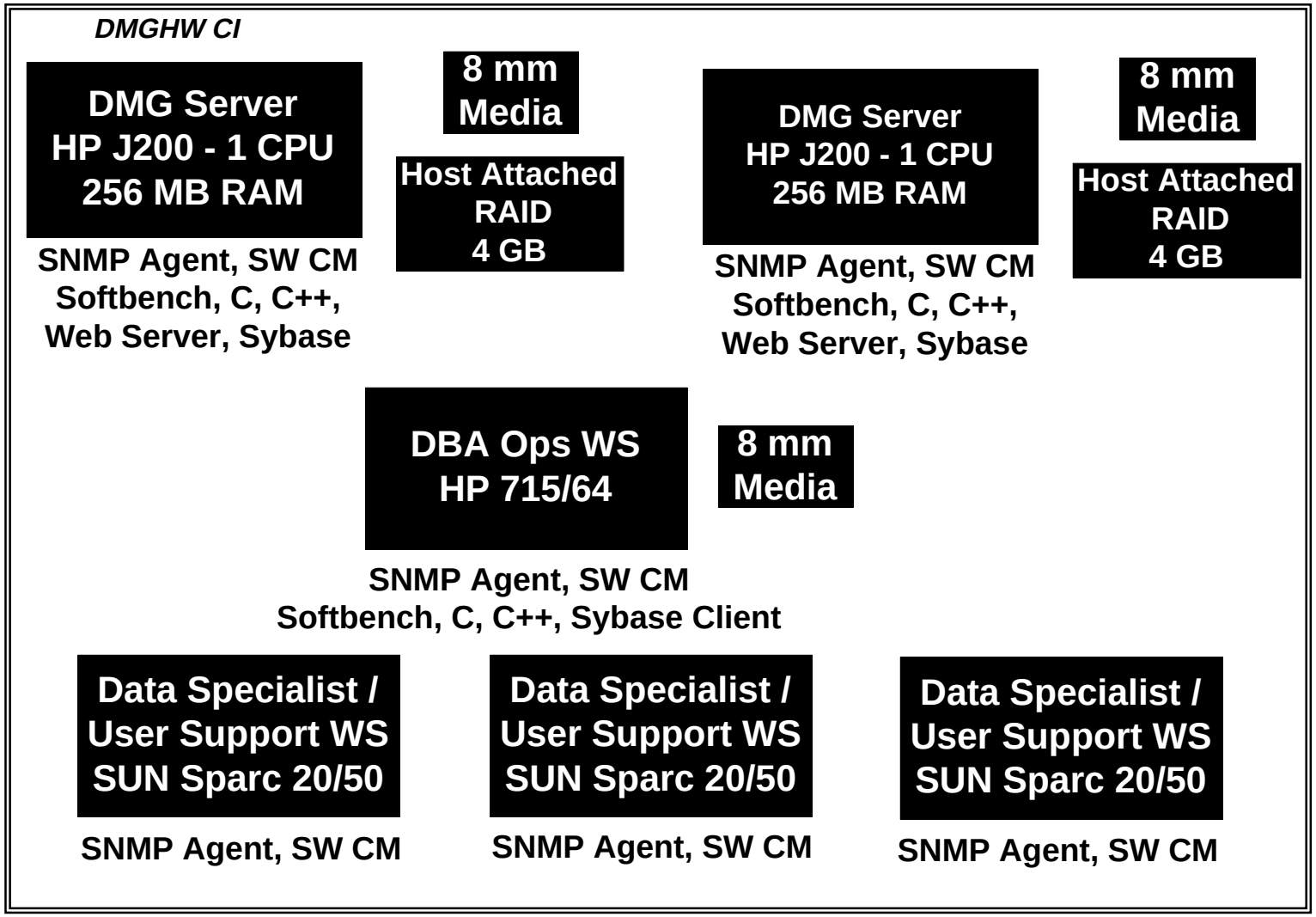
KEY: Ir1 - ☐ Release A - ■

GSFC Ingest Subsystem



KEY: Ir1 - Release A -

GSFC Data Management Subsystem



KEY: Ir1 - Release A

GSFC CSS and MSS Subsystems

MSS-HWCI and CSS-DCHWCI

HP RAID, Shared
20 GB

MSS Server
HP 755/25
256 MB

OpenView, Fault/Perf. Mgmt, Trouble Ticket, Sec. Mgmt, Sybase, SNMP Agent, DCE Client, C, C++

CSS Server
HP 755/25
256 MB

DCE Name, Security SNMP Agent, SW CM, Softbench, C, C++

MSS Workstation
SUN Sparc 20/50
96 MB RAM; 2 GB

+32 MB RAM, + 2 GB

SW CM Server (Clearcase) DDTS, Baseline Mgr, SNMP Agent, Sybase Client, DCE Client

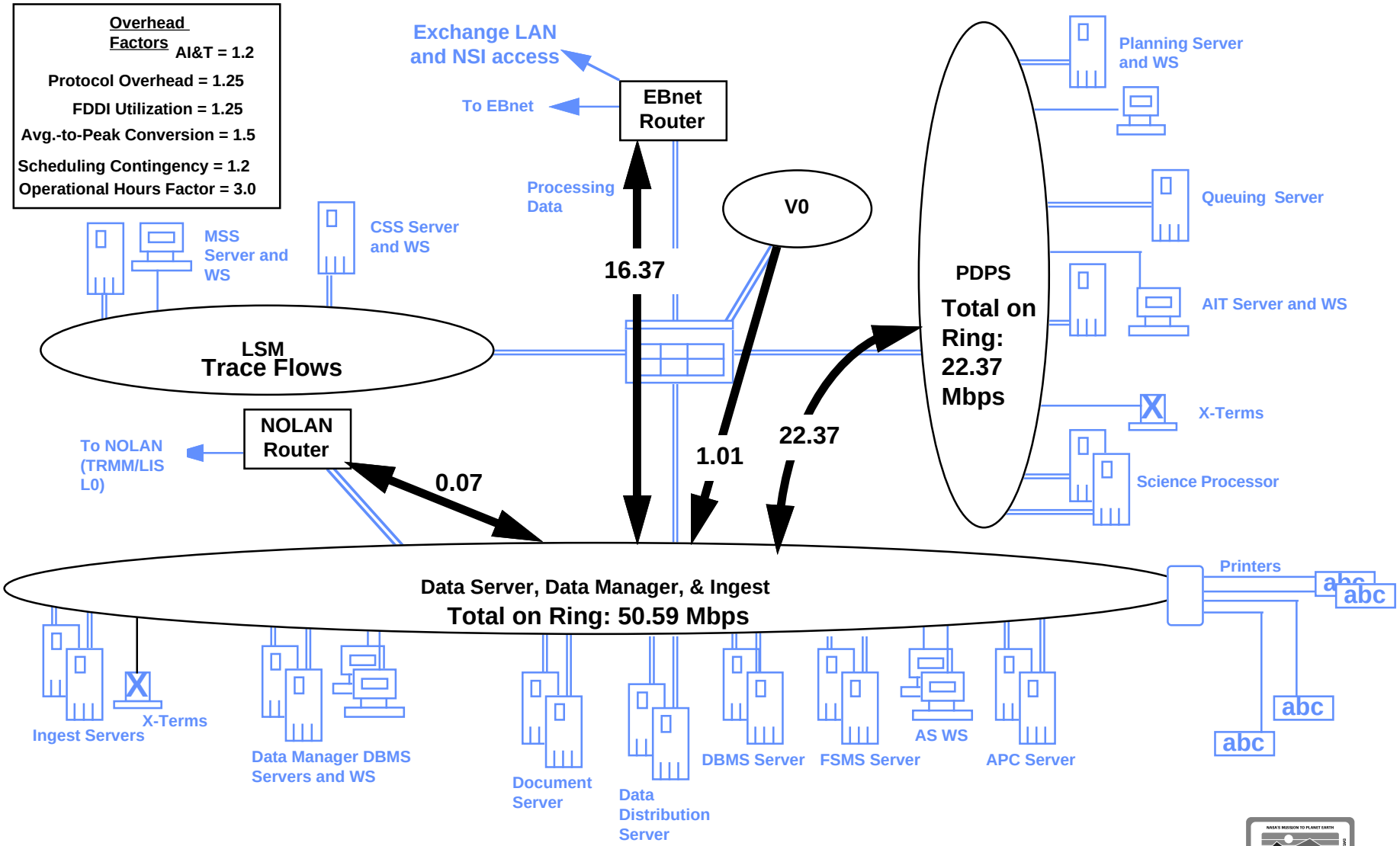
MSS Workstation
SUN Sparc 20/50
64 MB RAM; 2 GB

SNMP Agent, DCE Client, C, C++, Sparcworks

Printer
HP LaserJet 4M+
12ppm/14 MB RAM

KEY: Ir1 - Release A

MSFC Peak Network Flows (in Mbps)



MSFC Processing Subsystem At Release A

SPRHW CI

Science Processor
SGI Indy
256 MB; 6GB
(Ir1 & TRMM OPS)

SNMP Agent, SW CM CaseVision, IDL,IMSL,C, C++, F77, F90, DCE Dev Kit

8 mm Media

8 mm Tape Stacker

X-term

Science Processor
SGI Indy
256 MB; 6 GB
(TRMM OPS)

SNMP Agent, SW CM, CaseVision, IDL, IMSL, C, C++, F77, F90

Queuing Server
SUN Sparc 20/71
384 MB, 6 GB

Controlling Scheduler SW, SW CM, SNMP Agent, DCE Client, Sybase

AQAHW CI

Note: QA at MSFC is satisfied using science processors

AITHW CI

AIT W/S DBMS Server
SUN Sparc 20/50
128 MB, 4 GB

SNMP Agent, DCE Dev Kit, Doc. View SparcWorks, IDL, IMSL, Scheduler, C, C++. F77, F90, Ada, CM, Sybase

AIT Workstation
SUN Sparc 20/50
64MB, 2GB

SNMP Agent, DCE Dev Kit, Doc. View SparcWorks, IDL, IMSL, Scheduler, C, C++. F77, F90, Ada, CM

Printer
HP LaserJet 4M+
12ppm/14 MB RAM

KEY: Ir1 - ☐ Release A - ■

MSFC Planning Subsystem

PLNHW

Planning Server
SUN Sparc 20/71
384 MB, 6GB

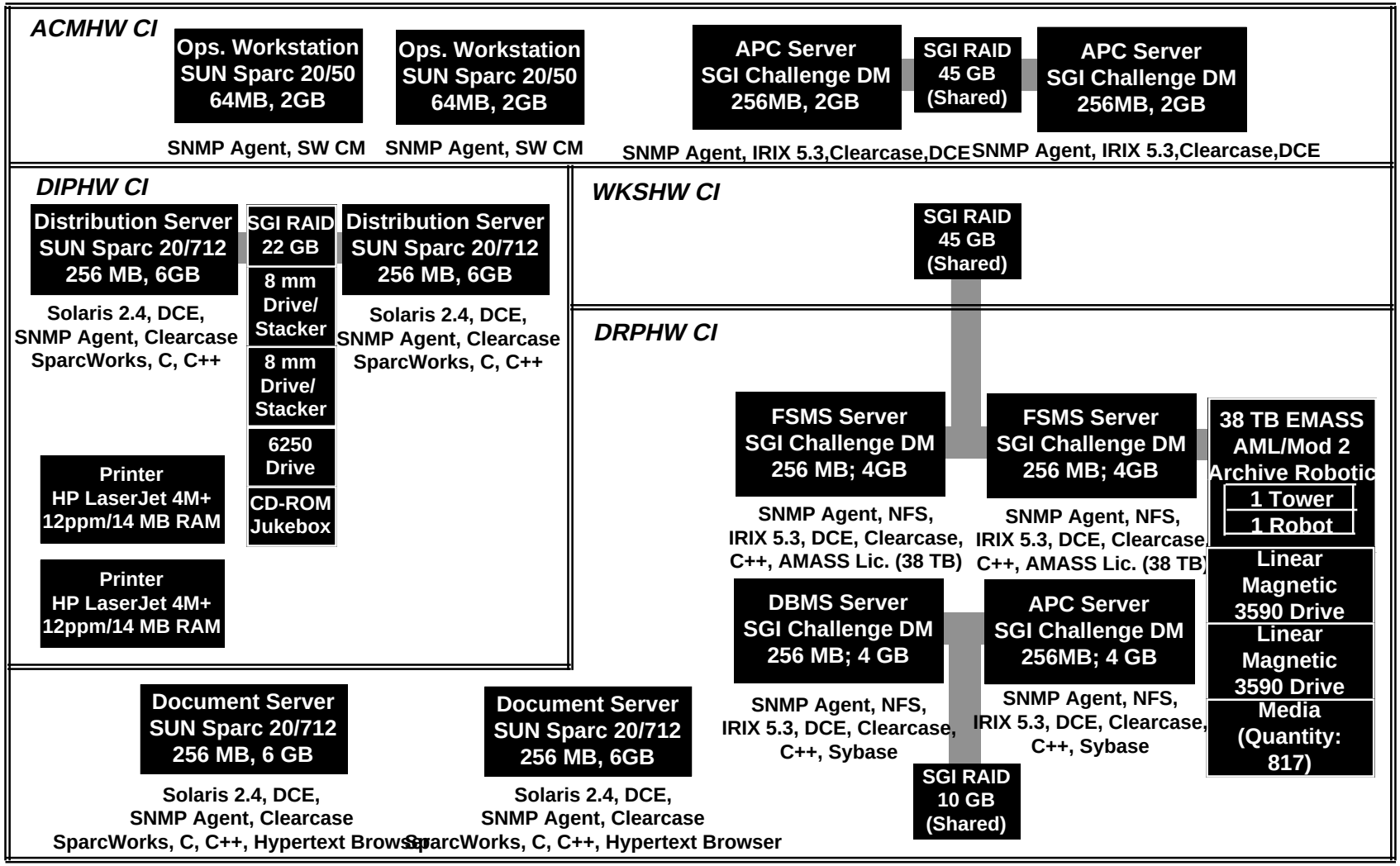
SNMP Agent, SW CM,
Sybase, Rept. Gen.
Controlling Scheduling SW

Planning Workstation
SUN Sparc 20/50
64 MB RAM

SNMP Agent, SW CM
C, C++ Sparcworks

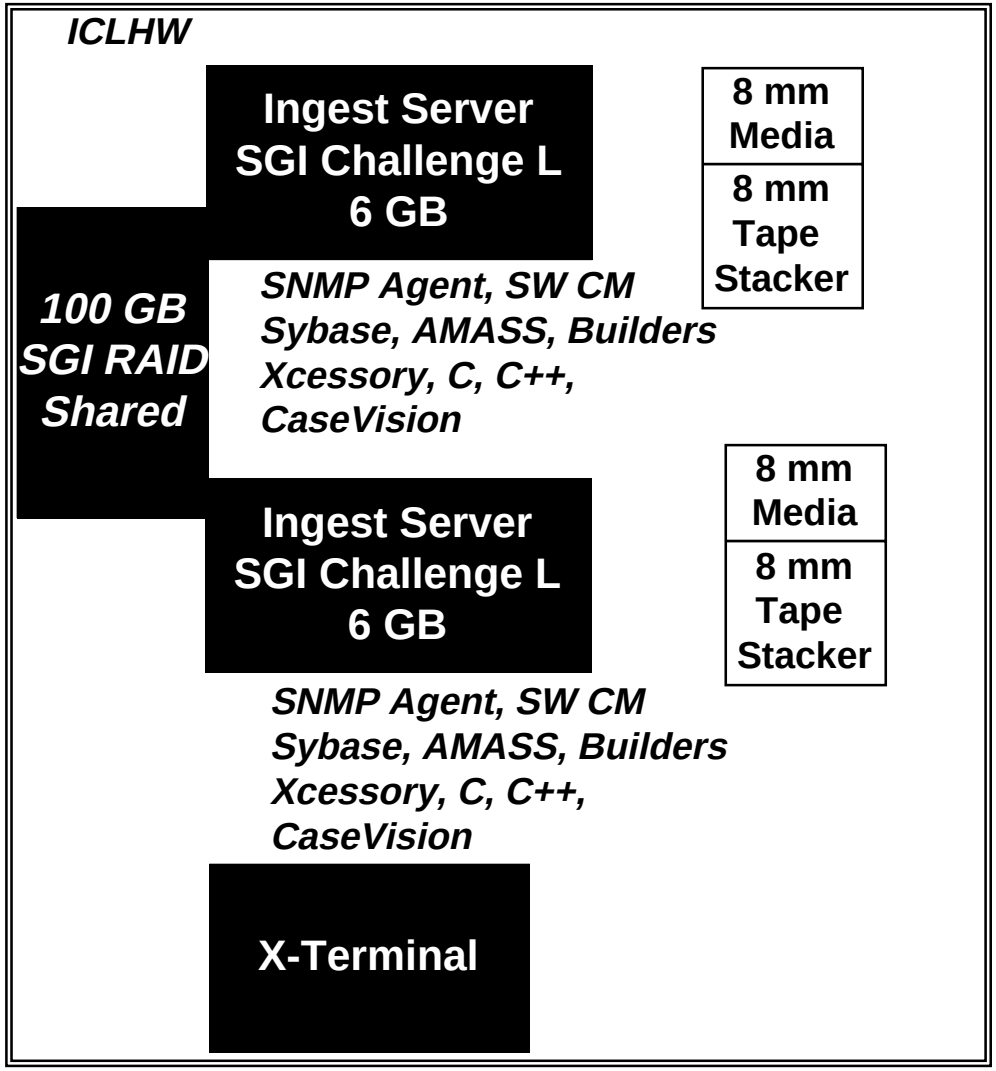
KEY: Ir1 - ☐ Release A - ■

MSFC Data Server For Release A



KEY: Ir1 - ☐ Release A - ■

MSFC Ingest Subsystem



KEY: Ir1 - ☐ Release A - ■

MSFC Data Management Subsystem

DMGHW CI

DMG Server
HP J200 - 1 CPU
256 MB RAM

8 mm Media

Host Attached RAID 4 GB

SNMP Agent, SW CM
Softbench, C, C++,
Web Server, Sybase

DMG Server
HP J200 - 1 CPU
256 MB RAM

8 mm Media

Host Attached RAID 4 GB

SNMP Agent, SW CM
Softbench, C, C++,
Web Server, Sybase

DBA Ops WS
HP 715/64

8 mm Media

SNMP Agent, SW CM
Softbench, C, C++, Sybase Client

Data Specialist / User Support WS
SUN Sparc 20/50

SNMP Agent, SW CM

Data Specialist / User Support WS
SUN Sparc 20/50

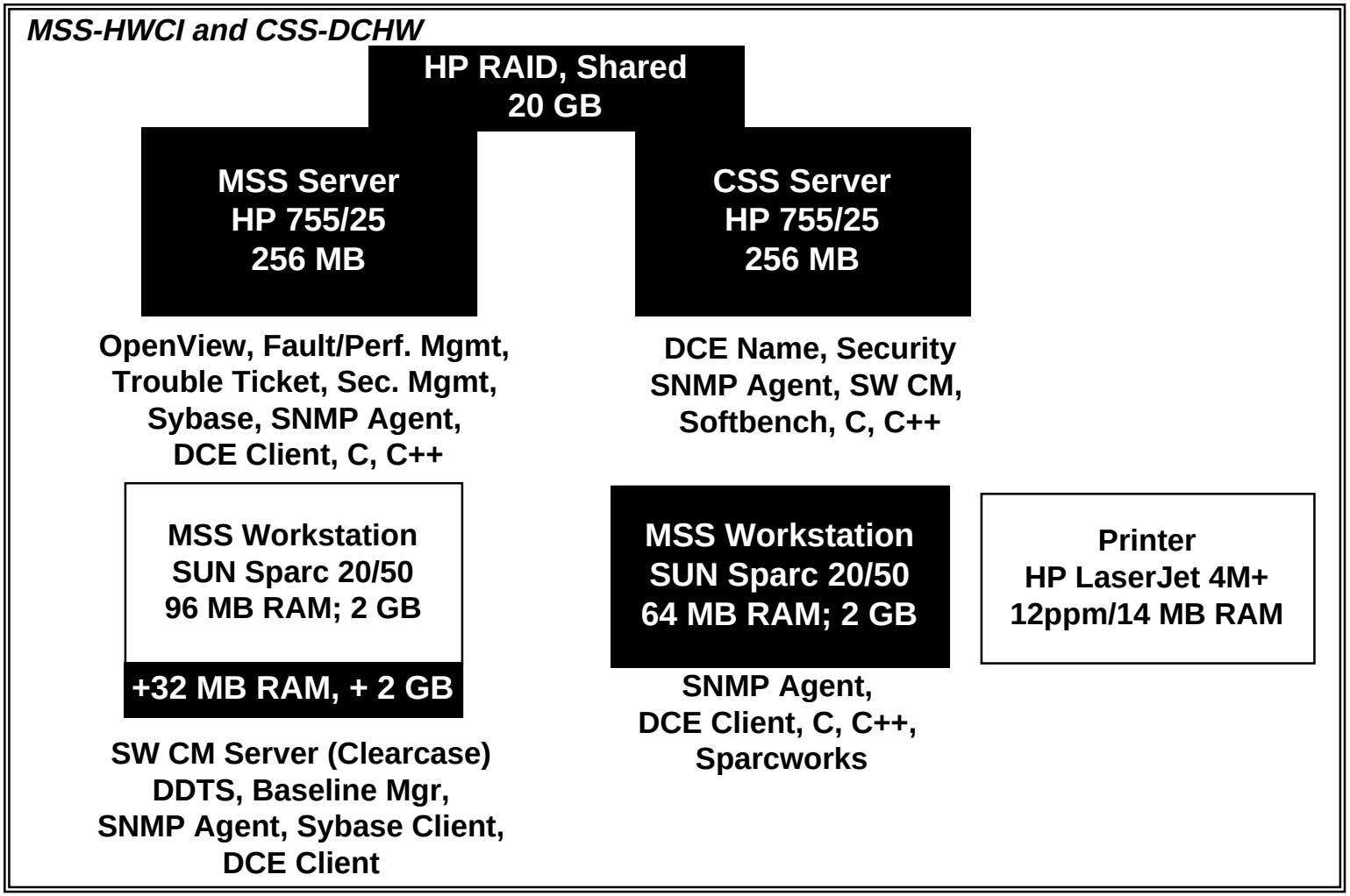
SNMP Agent, SW CM

Data Specialist / User Support WS
SUN Sparc 20/50

SNMP Agent, SW CM

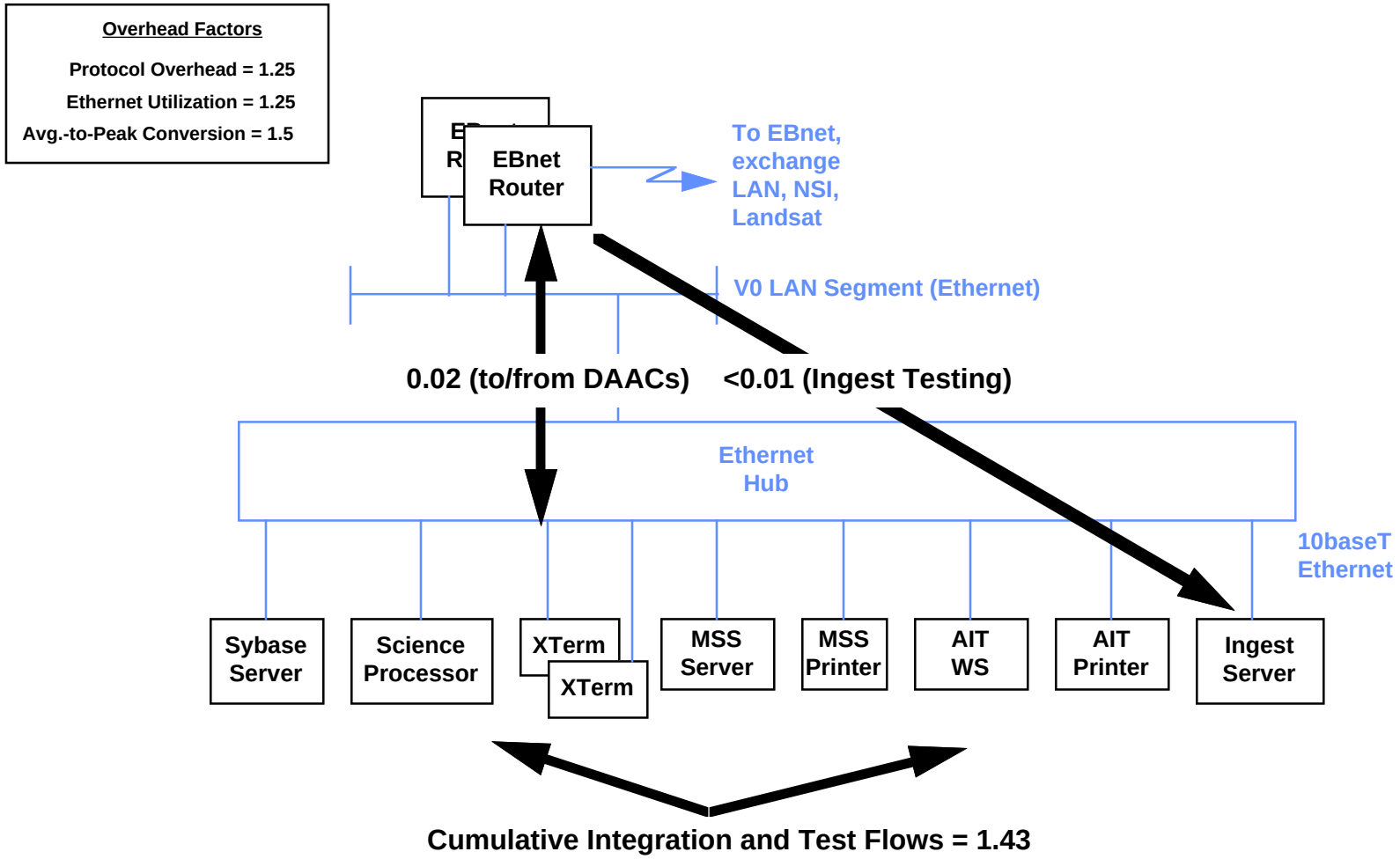
KEY: Ir1 - ☐ Release A - ■

MSFC CSS and MSS Subsystems



KEY: Ir1 - ☐ Release A - ■

EDC Peak Network Flows (in Mbps)



EDC Processing Subsystem At Release A

SPRHW CI

Science Processor
SGI PC XL 2 CPU
4 mm: CD ROM
256 MB (AM-1 AI&T)
+ 2 CPUs
256 MB

SNMP Agent, SW CM
CaseVision, IDL,IMSL,C,
C++, F77, F90, DCE Dev Kit,
Sybase

8 mm Media

8 mm Tape Stacker

SGI RAID 43 GB

SGI RAID +43 GB

X-Term

X-Term

AQAHW CI

(No QA H/W at EDC During Release A)

AITHW CI

AIT Workstation
SUN Sparc 20/50
64MB, 2GB

SNMP Agent, DCE Client,
Doc. View, SparcWorks, C, F77,
F90, SW CM,,IDL, IMSL,
Scheduler, Rept. Gen.

AIT W/S DBMS Server
SUN Sparc 20/50
128 MB

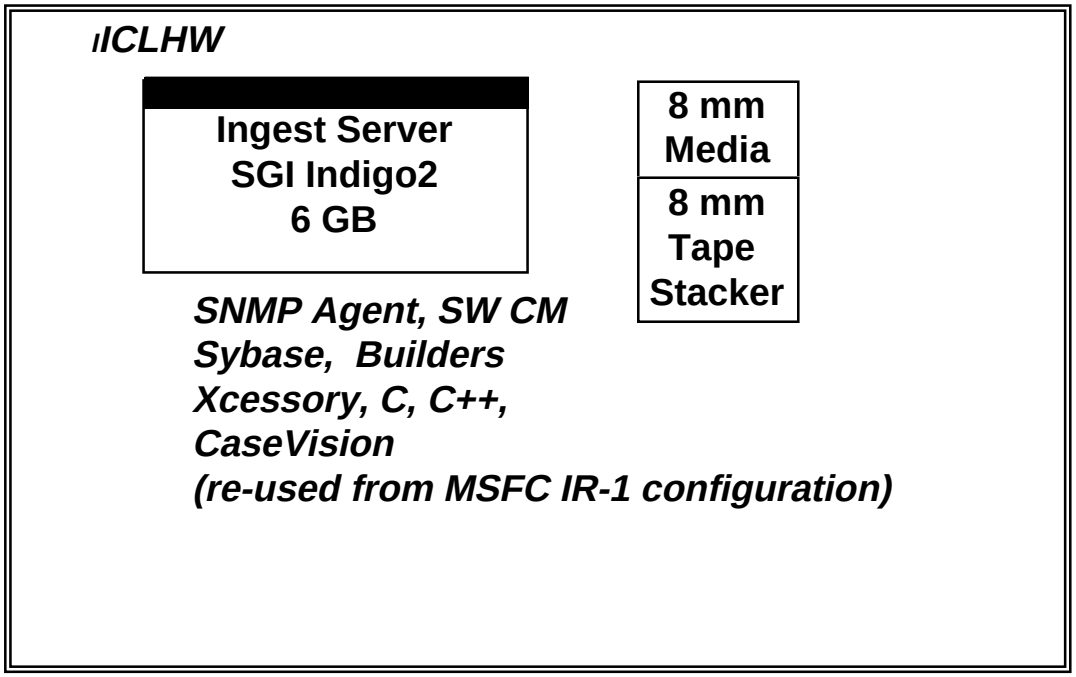
SNMP Agent, DCE Client,
Doc. View, SparcWorks, C, F77,
F90, SW CM,,IDL, IMSL,
Scheduler, Sybase

SUN Disk
29 GB

Printer
HP LaserJet 4M+
12ppm/14 MB RAM

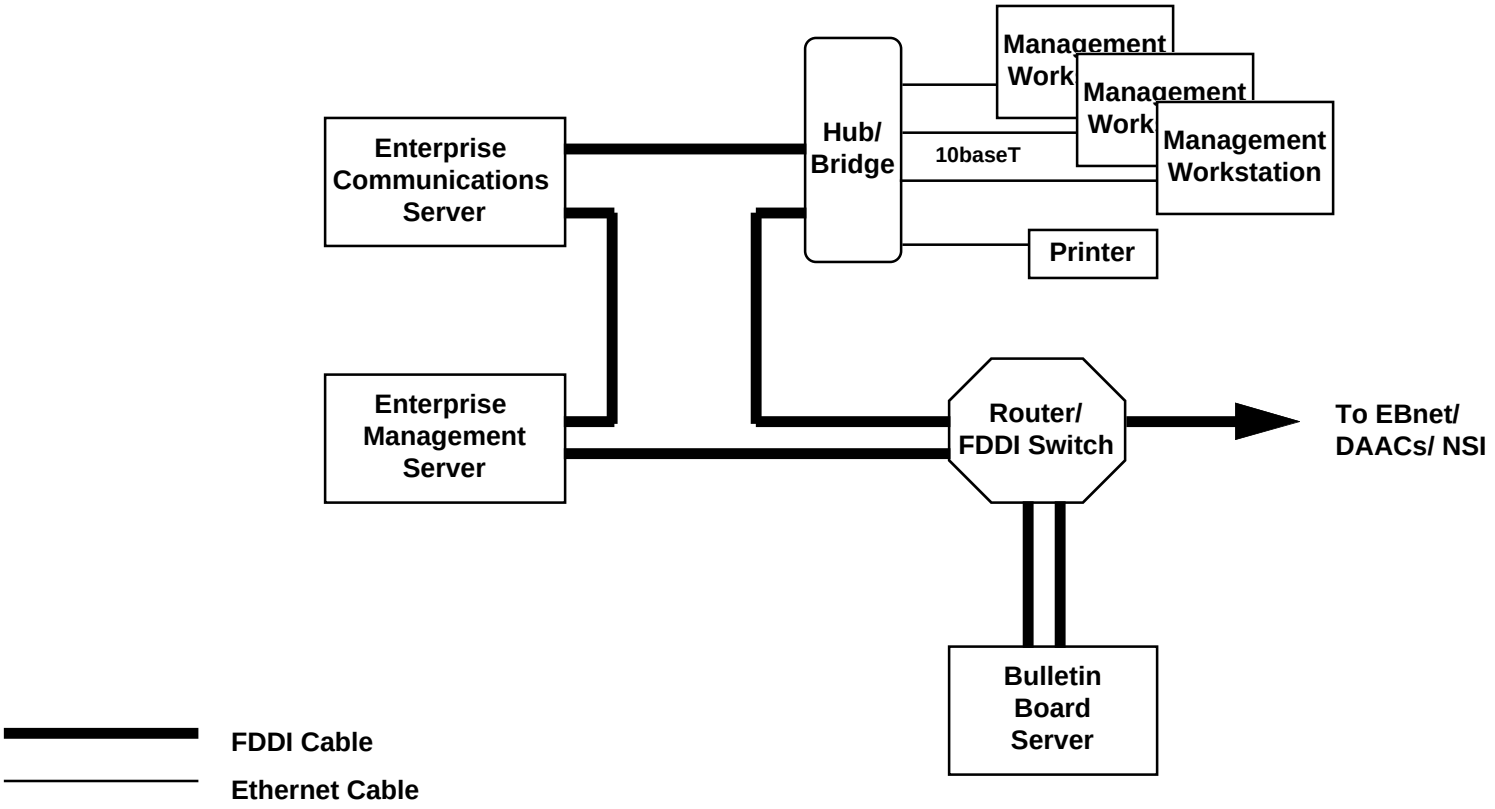
KEY: Ir1 - ☐ Release A - ■

EDC Ingest Subsystem



KEY: Ir1 - ☐ Release A - ■

SMC Network Topology



SMC CSS and MSS Subsystems

MSSHW and CSSDCHW

HP RAID, Shared
20 GB

MSS Server
HP 755/25
256 MB

OpenView, Fault/Perf. Mgmt, Trouble Ticket, Sec. Mgmt, Sybase, SNMP Agent, DCE Client, C, C++

CSS Server
HP 755/25
256 MB

DCE Name, Security SNMP Agent, SW CM, Softbench, C, C++

Printer
HP LaserJet 4M+
12ppm/14 MB RAM

CSS Bulletin Board
SUN Sparc 20/50
128 MB RAM; 4 GB

SNMP Agent, Software CM, DCE Client, C, C++, Rept. Gen.

MSS Workstation
SUN Sparc 20/50
128 MB RAM; 4 GB

SNMP Agent, DCE Client, C, C++, Sparcworks

MSS Workstation
SUN Sparc 20/50
64 MB RAM; 2 GB

SW CM Server (Clearcase) DDTS, Baseline Mgr, SNMP Agent, Sybase Client, DCE Client

KEY: Ir1 - ☐ Release A - ■